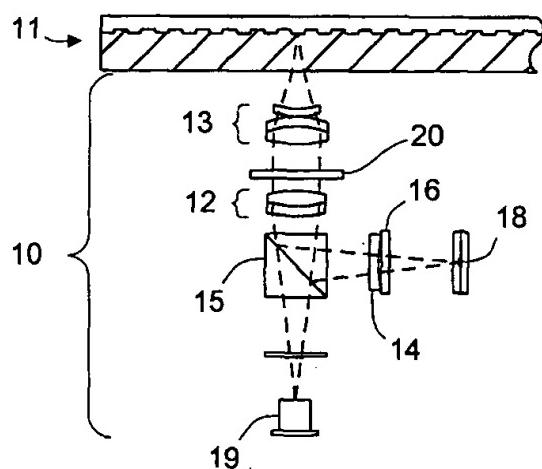


SOURCE: EPO  
Title: TRACKABLE OPTICAL DISCS  
WITH CONCURRENTLY READABLE  
ANALYTE MATERIAL  
Inventor: Mark O. Worthington  
Docket No: BTI1 98100804(US)USX1P1X1



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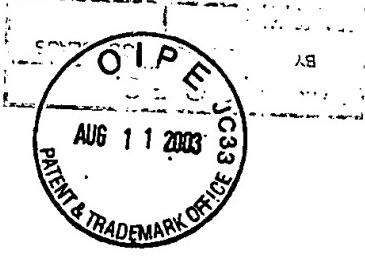


**FIG. 1A**

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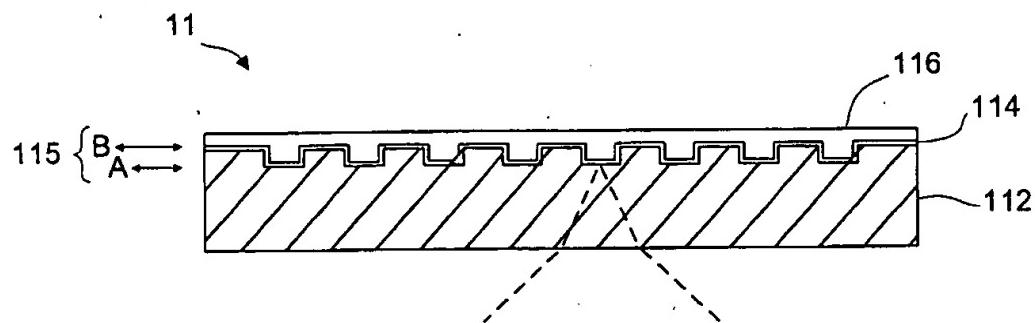
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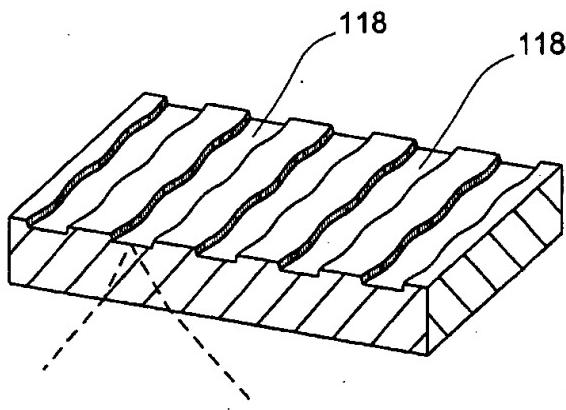


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Inventor: Mark O. Worthington  
Docket No: BTI1 98100804(US)USX1P1X1

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**FIG. 1B**



**FIG. 1C**

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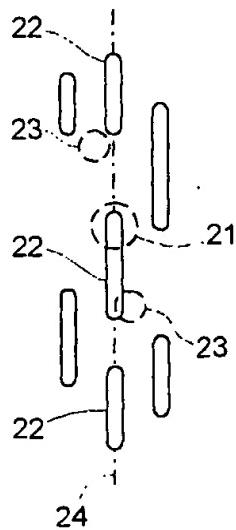
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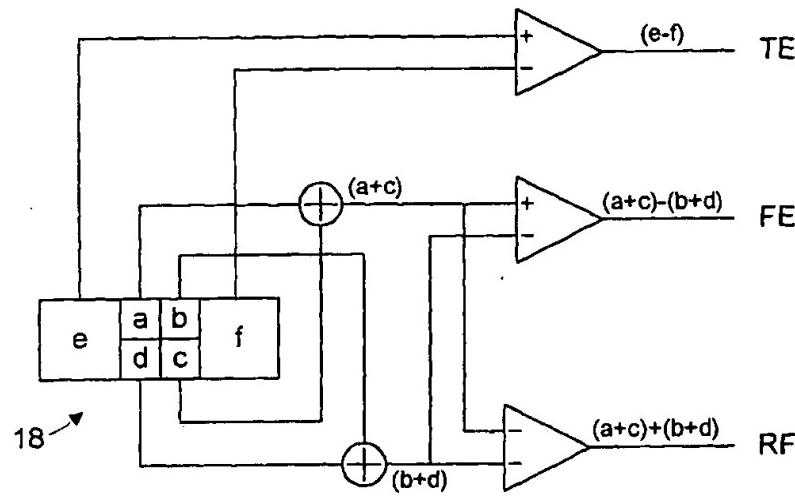


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Docket No: BTI1 98100804(US)USX1P1X1

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**FIG. 2A**



**FIG. 2B**

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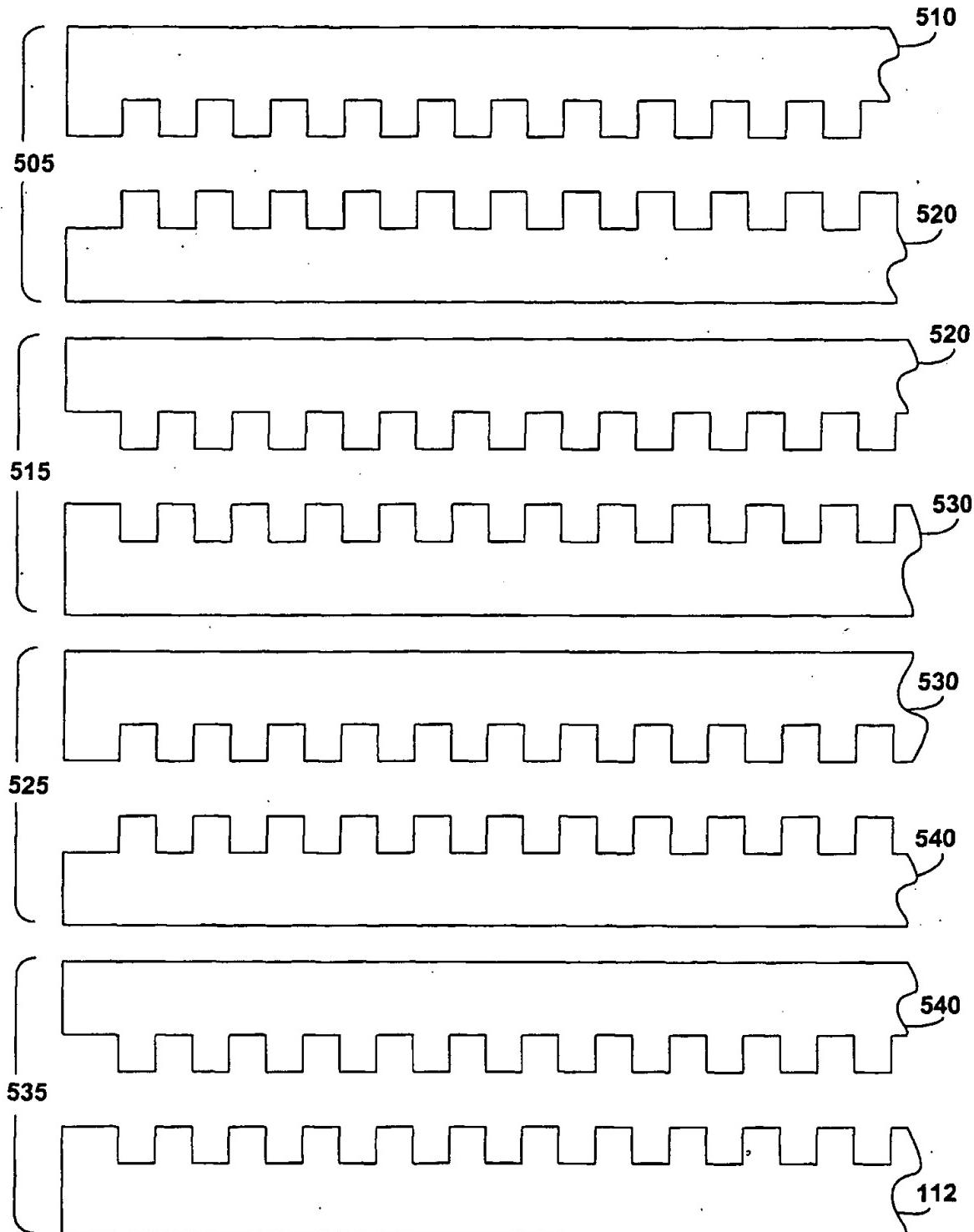
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**FIG. 3A**



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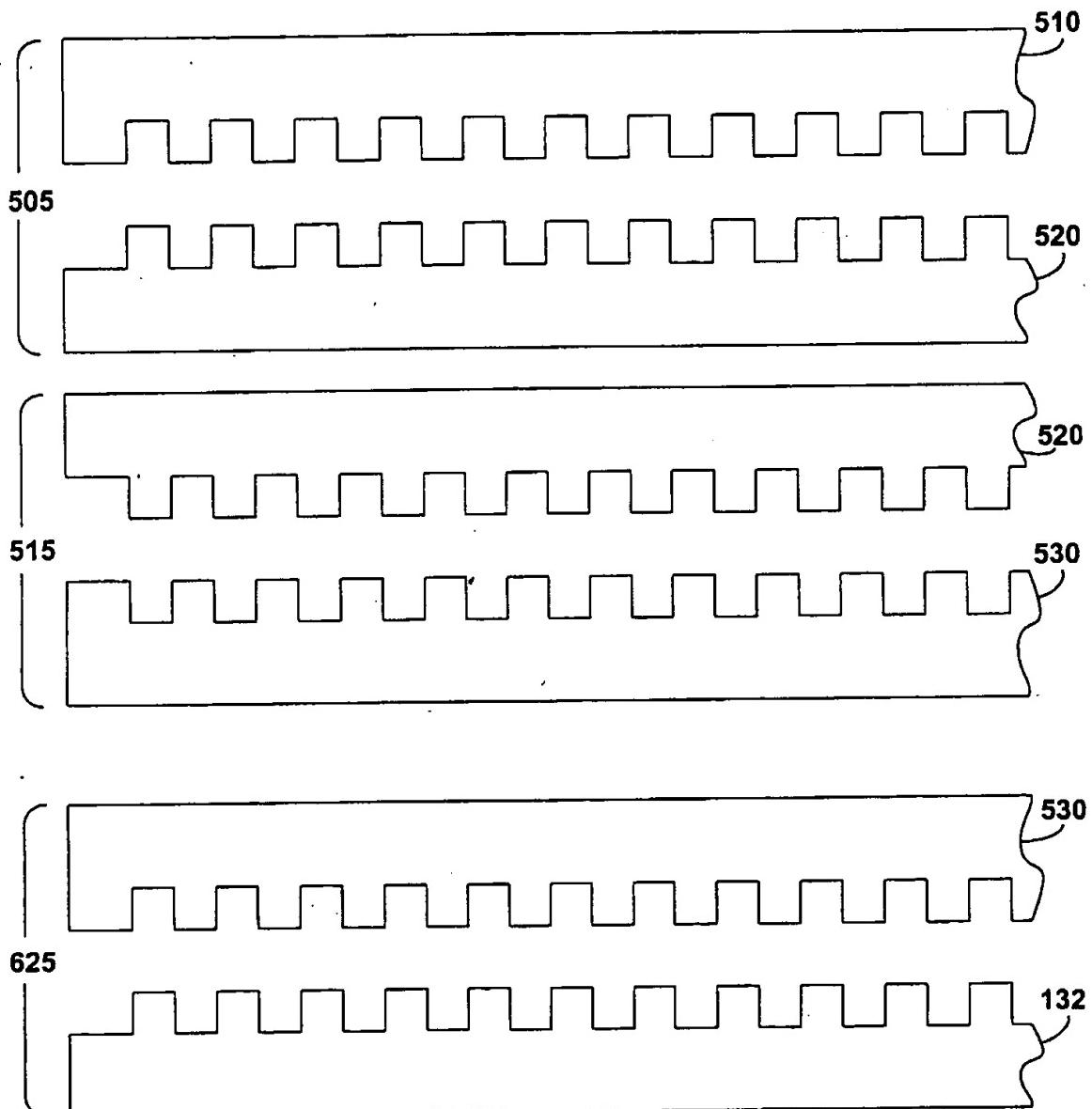
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**FIG. 3B**



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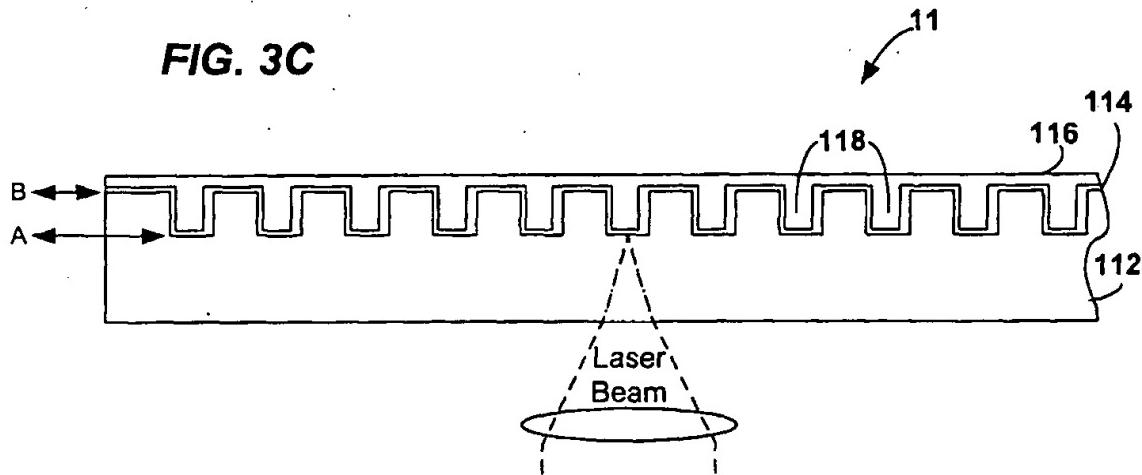
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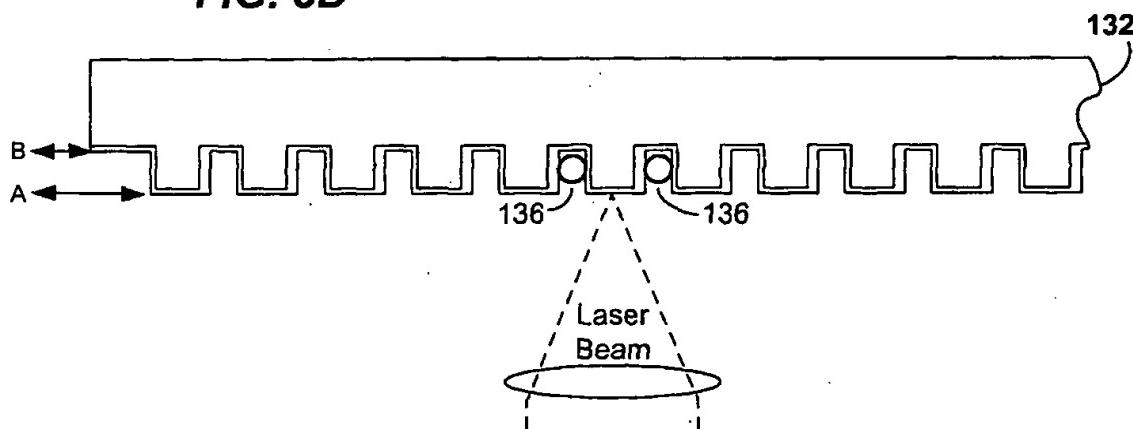
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Docket No: BT11 98100804(US)USX1P1X1

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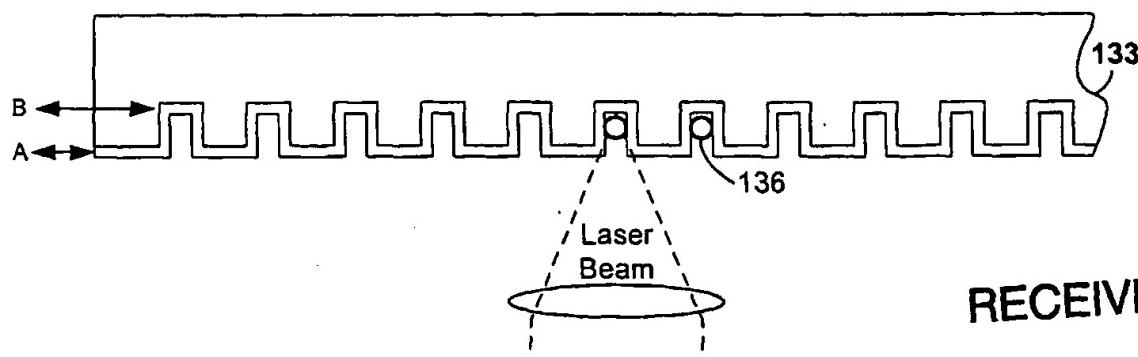
**FIG. 3C**



**FIG. 3D**



**FIG. 3E**



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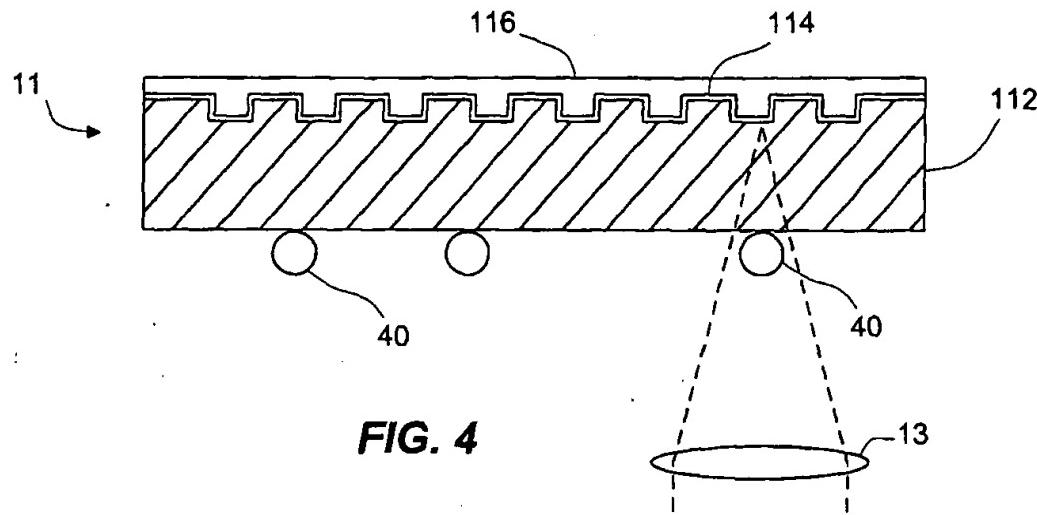
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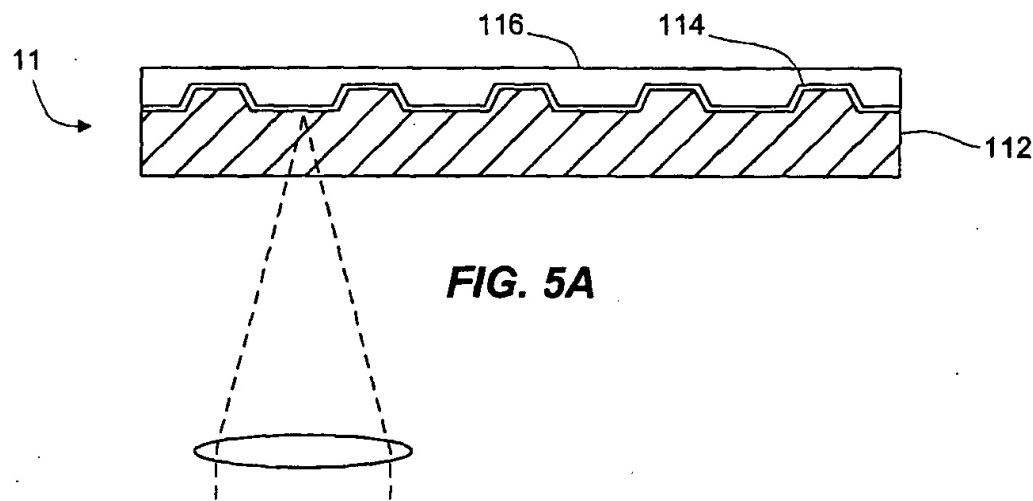


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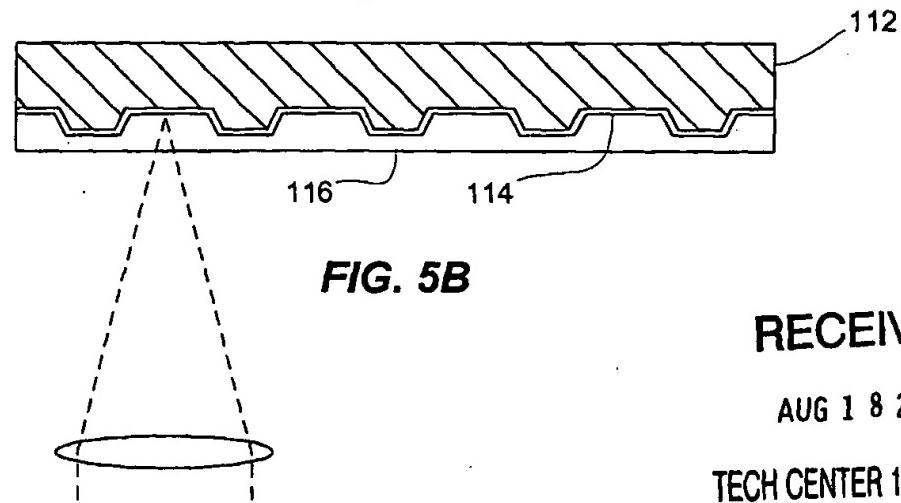
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**FIG. 4**



**FIG. 5A**



**FIG. 5B**

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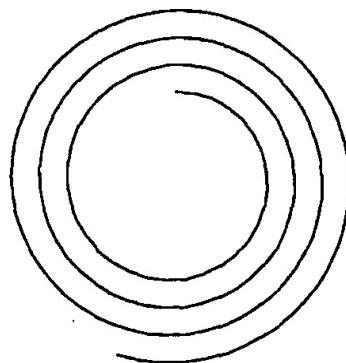
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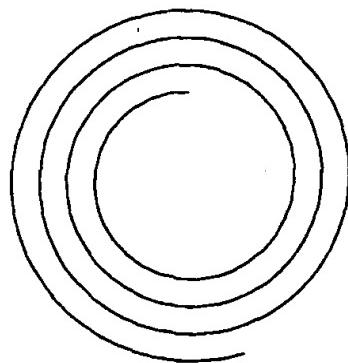


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**FIG. 5C**



**FIG. 5D**

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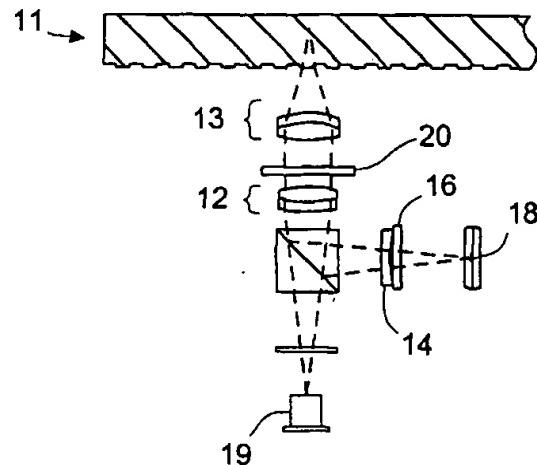
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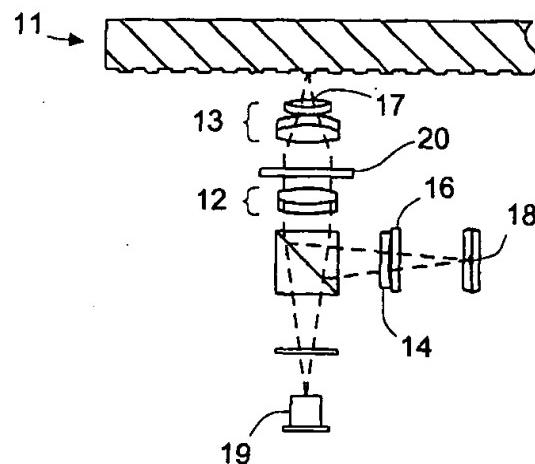


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**FIG. 6A**



**FIG. 6B**

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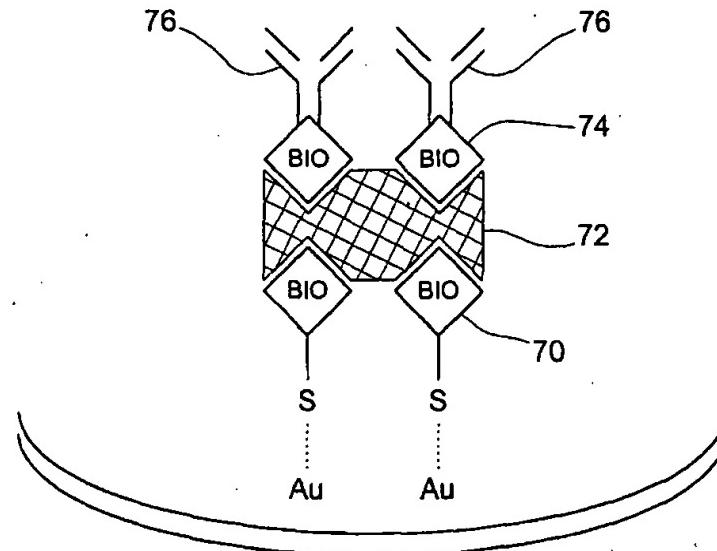
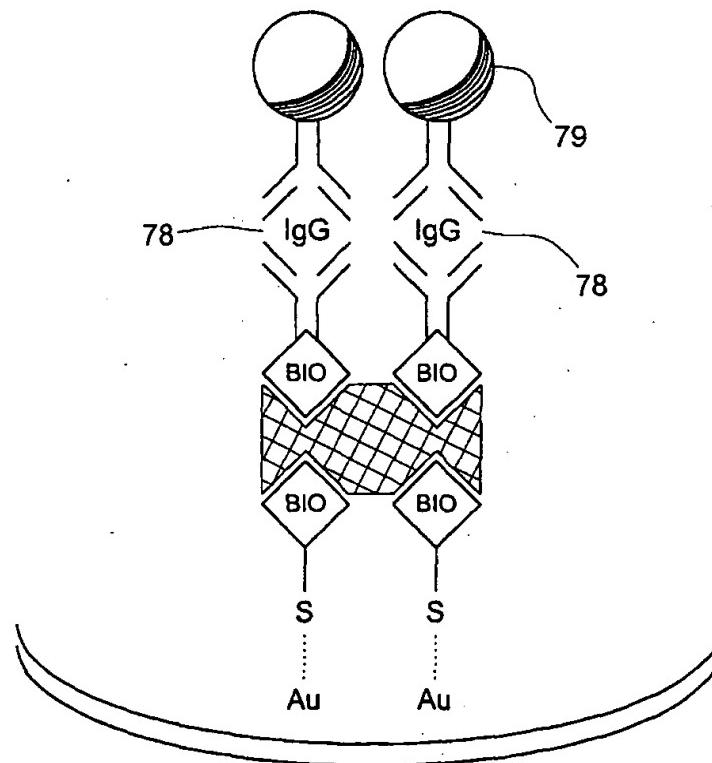


FIG. 7A



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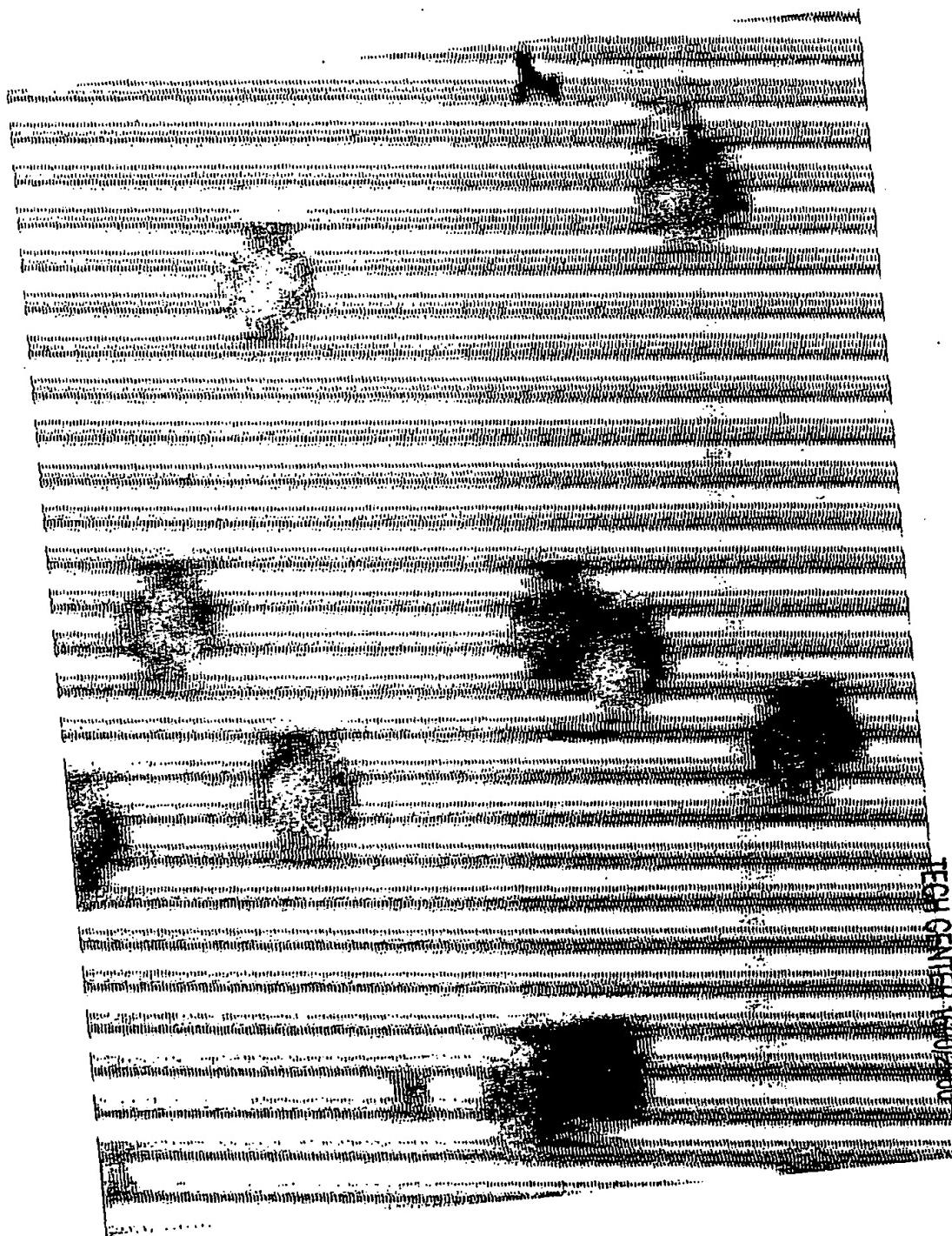
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FIG. 7B

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FIG. 8

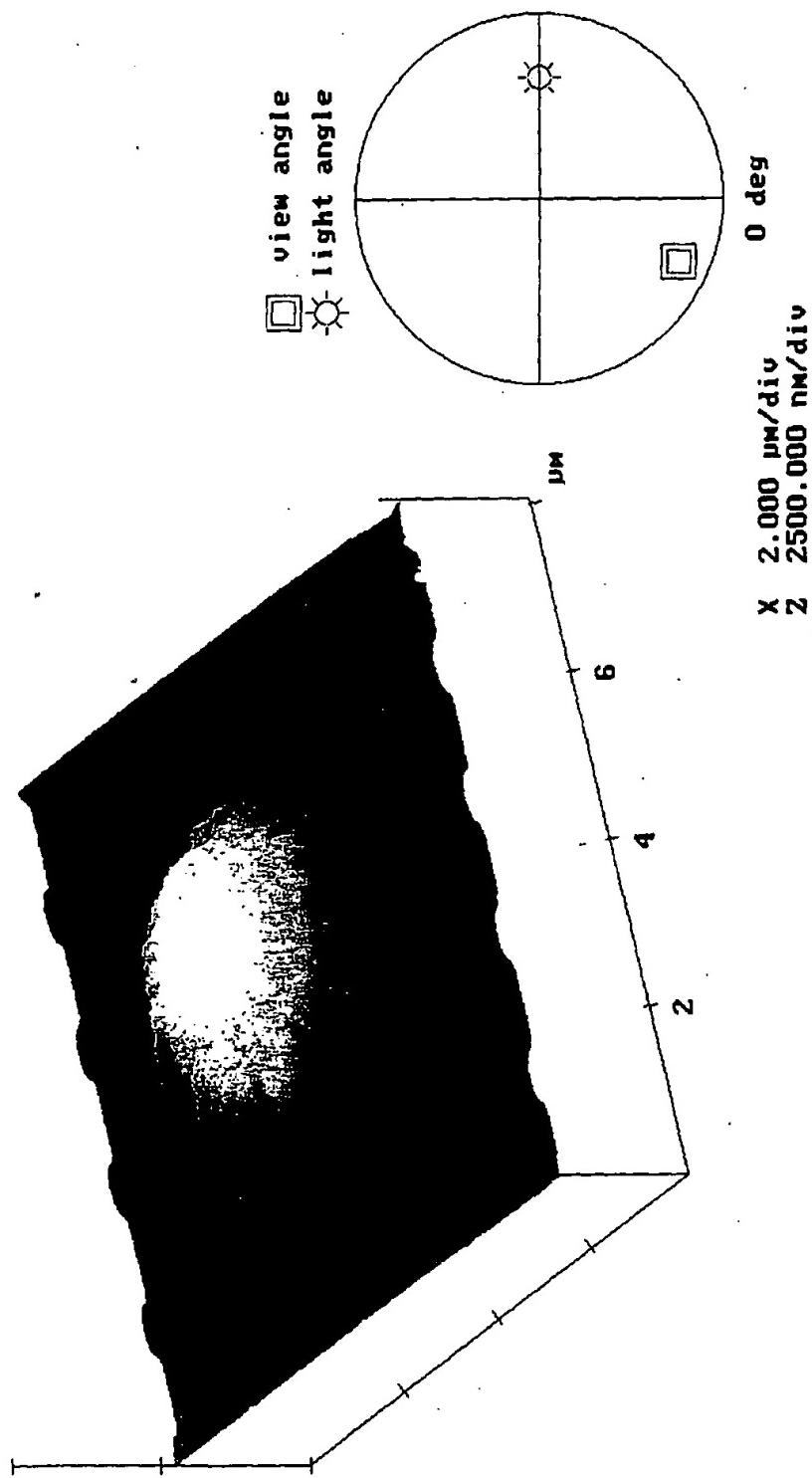


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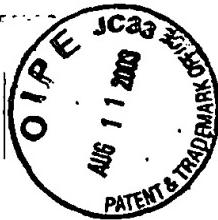
Sphere on Wobble Groove

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FIG. 9



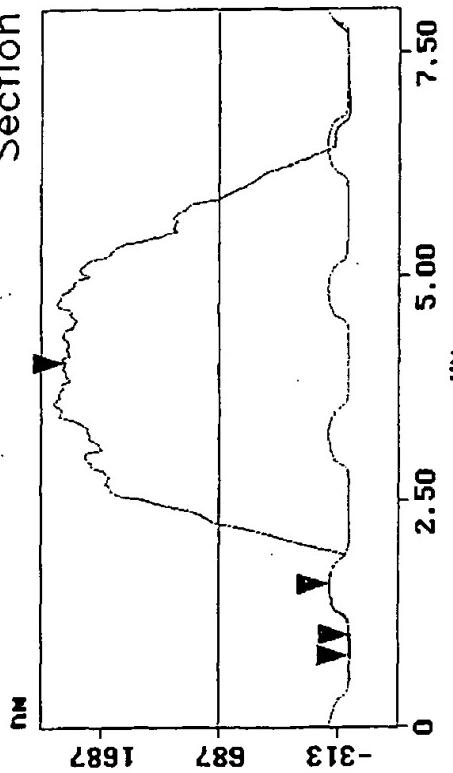
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Inventor: Mark O. Worthington  
Docket No: BTI1 98100804(US)USX1P1X1

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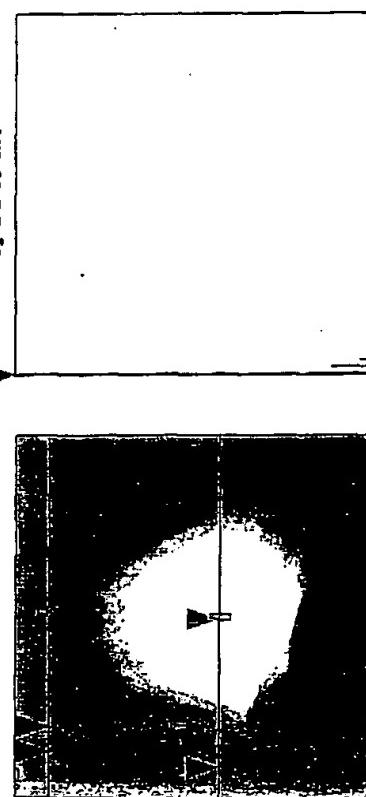
*F/G. 10*

Cursor Marker Spectrum Zoom Center Line Offset Clear

### Section Analysis



L	562.50 nm
RMS	72.881 nm
Ic	DC
Ra(Ic)	21.437 nm
RMax	79.940 nm
RZ	66.462 nm
RZ Cnt	4
Radius	301.86 nm
Sigma	40.332 nm
Surface distance	631.28 nm
Horiz distance(L)	562.50 nm
Vert distance	171.70 nm
Angle	16.975 deg
Surface distance	5.531 μm
Horiz distance	3.266 μm
Vert distance	2.407 μm
Angle	36.388 deg
Surface distance	
Horiz distance	
Vert distance	
Angle	
Spectral period	DC
Spectral freq	0 Hz
Spectral RMS amp	469.97 nm

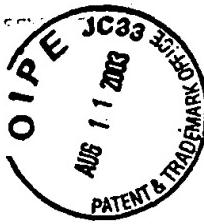


Sph re on Wobble Groove  
grating.013  
Cursor: Fixed 2 Zoom: 2:1 Cen Line: off offset: on

Min

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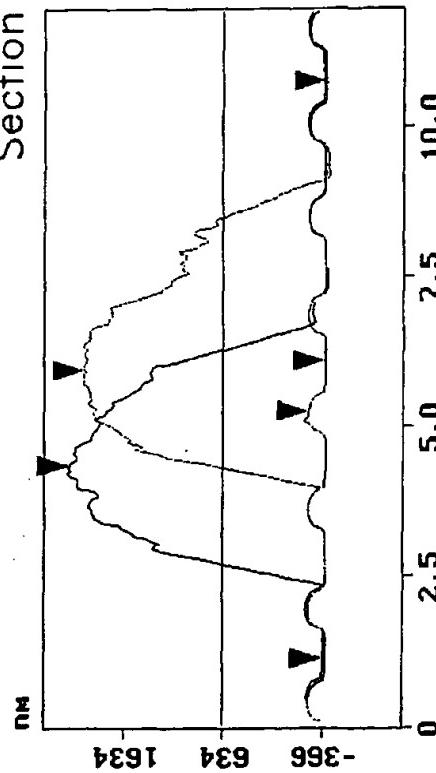


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Cursor Marker Spectrum Zoom Center Line offset Clear

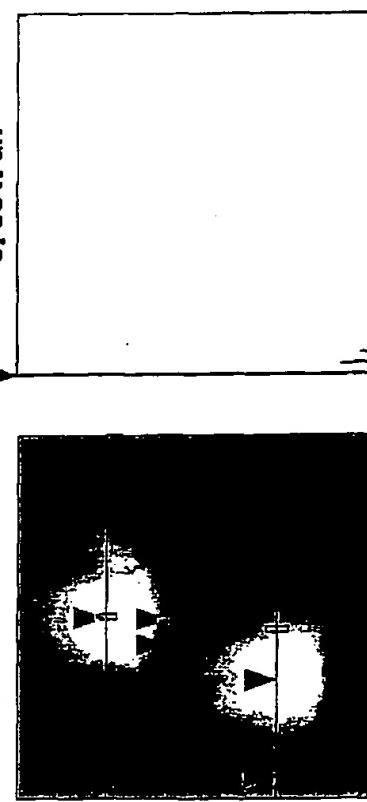
### Section Analysis



L	843.75 nm
RMS	63.849 nm
1c	DC
Ra(1c)	27.782 nm
Rmax	97.447 nm
Rz	96.754 nm
Rz Cnt 2	
Radius	450.61 nm
Sigma	62.095 nm

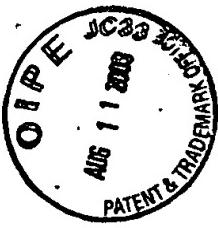
Surface distance	6.867 μm
Horiz distance(L)	4.828 μm
Vert distance	2.445 μm
Angle	26.858 deg
Surface distance	894.27 nm
Horiz distance	843.75 nm
Vert distance	169.96 nm
Angle	11.389 deg
Surface distance	5.302 μm
Horiz distance	3.211 μm
Vert distance	2.568 μm
Angle	38.649 deg
Spectral period	DC
Spectral freq	0 Hz
Spectral RMS amp	461.26 nm



Sphere on Hobbie Groove DC Min  
grating.014 Cursor: fixed 3 Zoom: 2:1 Cen line: off offset: on

F/G. 11

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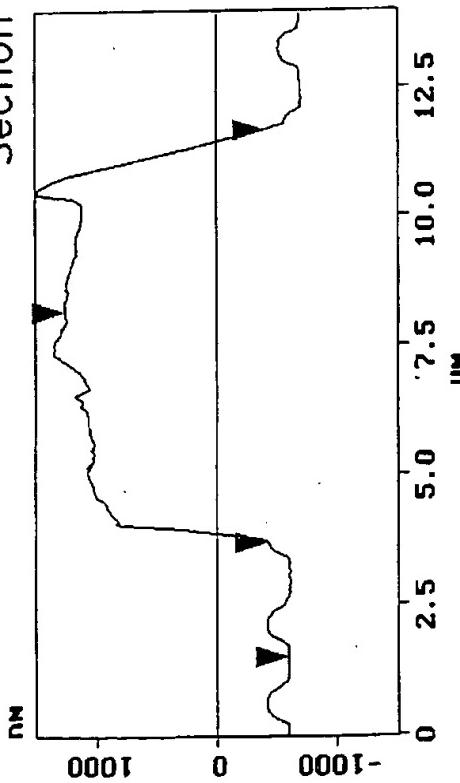


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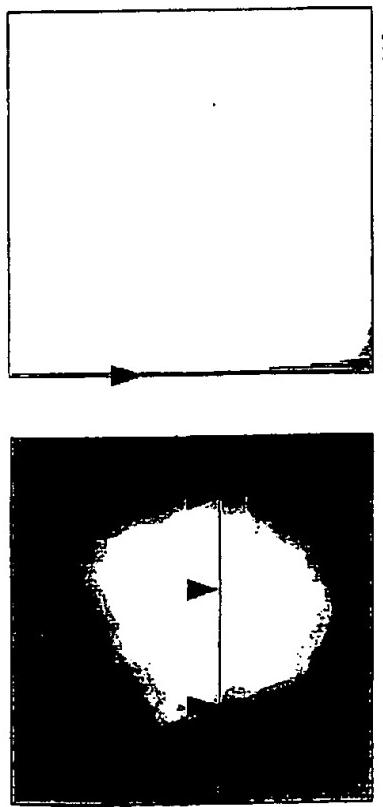
Cursor Marker Spectrum Zoom Center Line offset Clear

### Section Analysis



L	6.672 $\mu$ m
RMS	782.05 nm
Ic	DC
Ra(Ic)	284.31 nm
RMax	1.187 $\mu$ m
Rz	868.11 nm
Rz Cnt	4
Radius	3.512 $\mu$ m
Sigma	426.35 nm

Surface distance	10.707 $\mu$ m
Horiz distance(L)	7.984 $\mu$ m
Vert distance	11.549 $\mu$ m
Angle	0.083 deg
Surface distance	8.179 $\mu$ m
Horiz distance	6.672 $\mu$ m
Vert distance	1.860 $\mu$ m
Angle	15.575 deg
Surface distance	
Horiz distance	
Vert distance	
Angle	
Spectral period	DC
Spectral freq	0 Hz
Spectral RMS amp	493.32 nm



Cells on Mottle Groove  
grating.016

Cursor: fixed Zoom: 2:1 Cen line: off Offset: off

Min

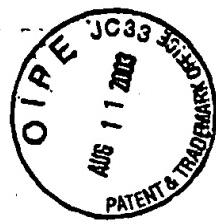
DC

Max

FIG. 12

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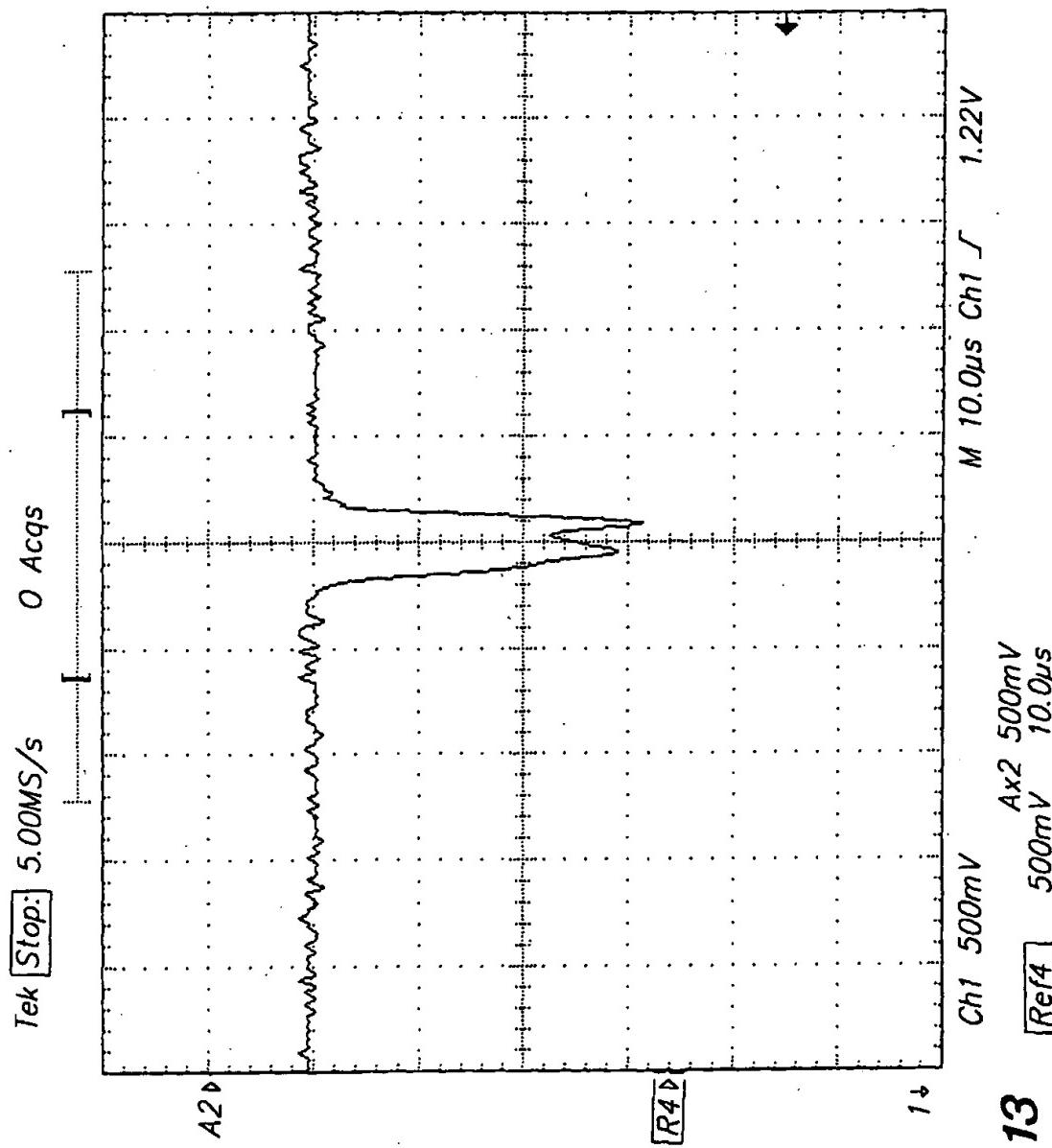
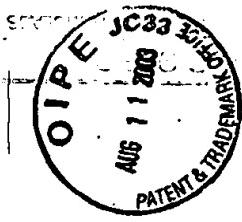


FIG. 13

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Tek [Stop: 5.00MS/s 0 Acqs

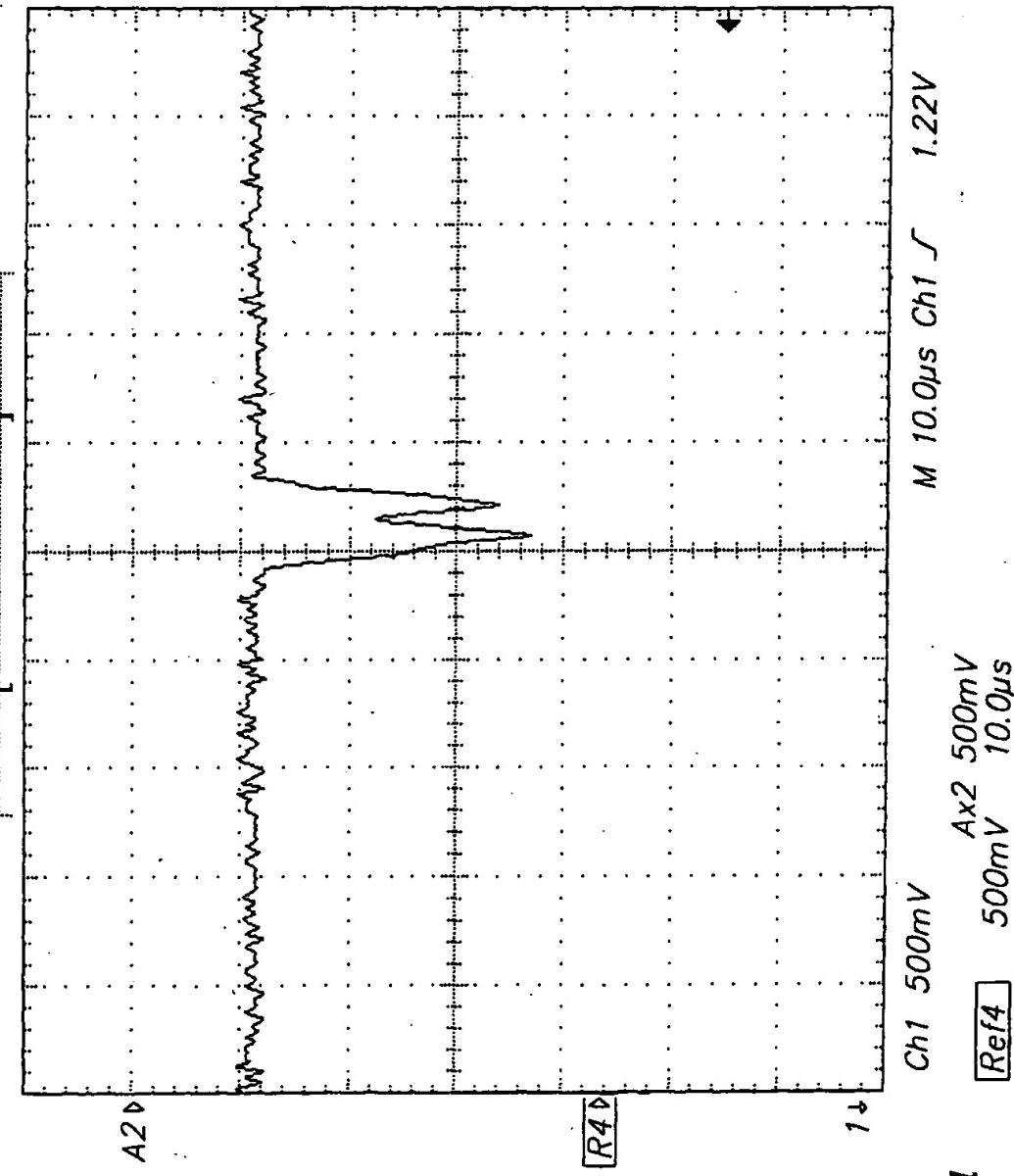


FIG. 14

[Ref4]

Ch1 500mV

Ax2 500mV  
10.0μs

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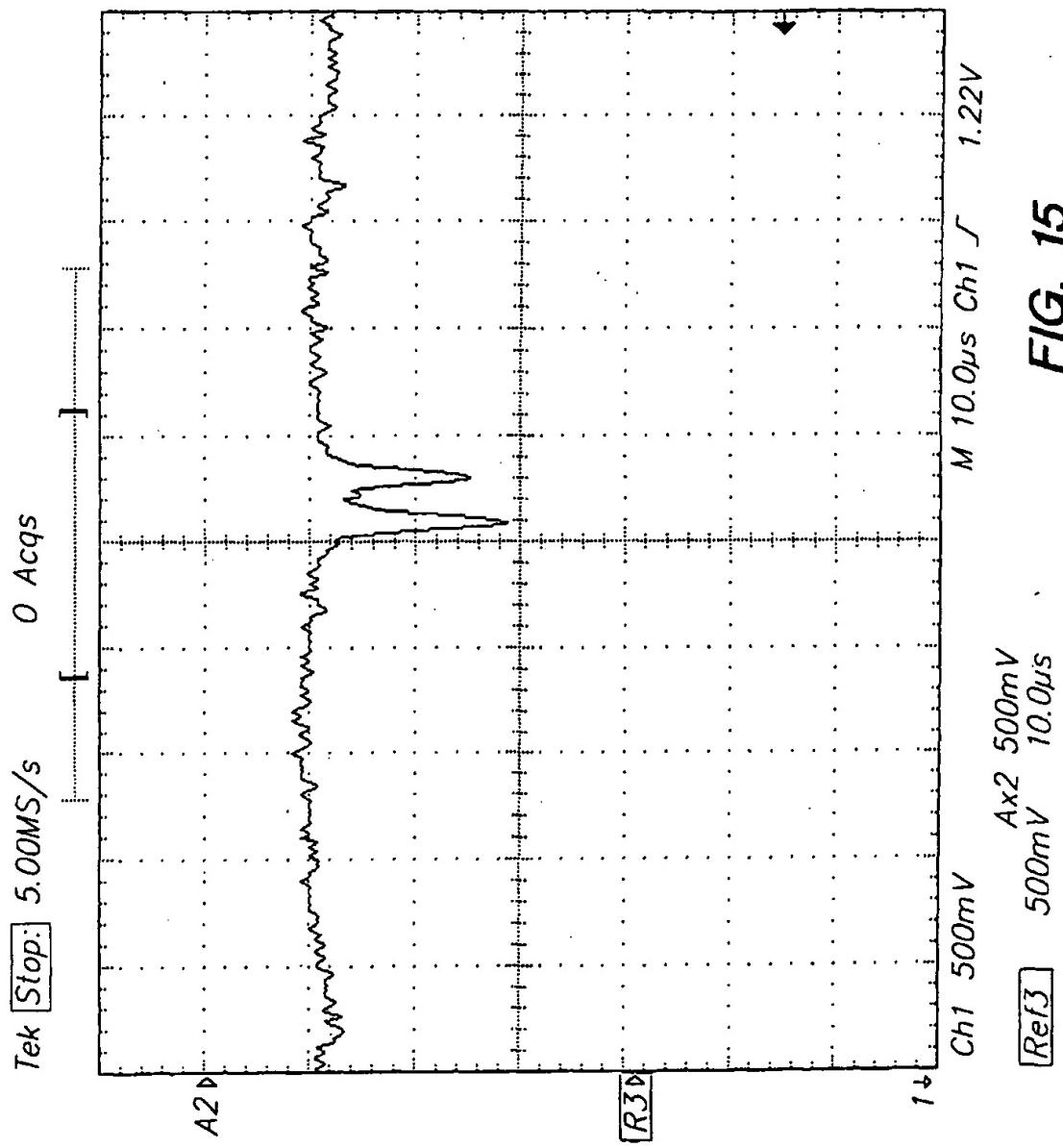


FIG. 15

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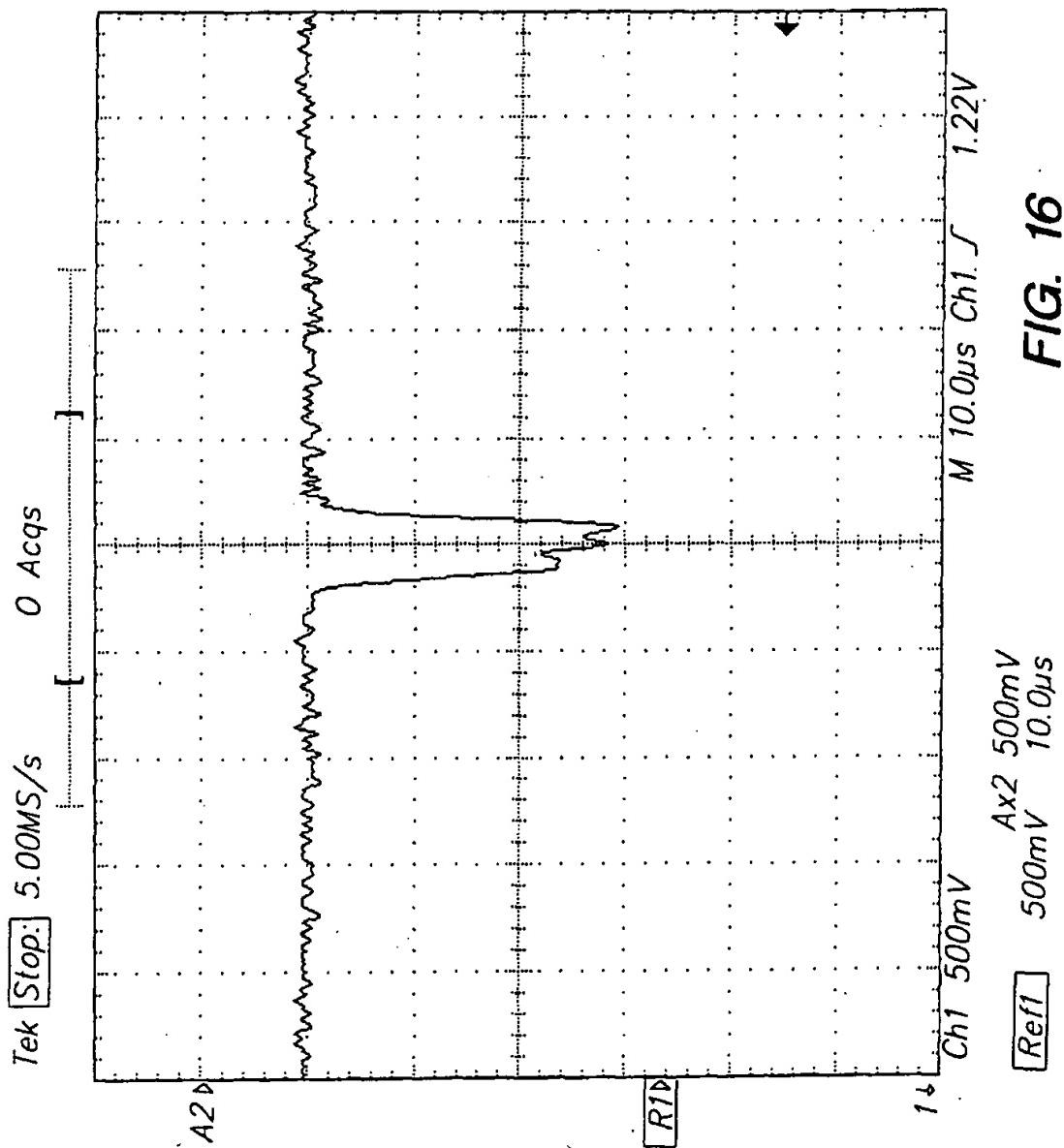
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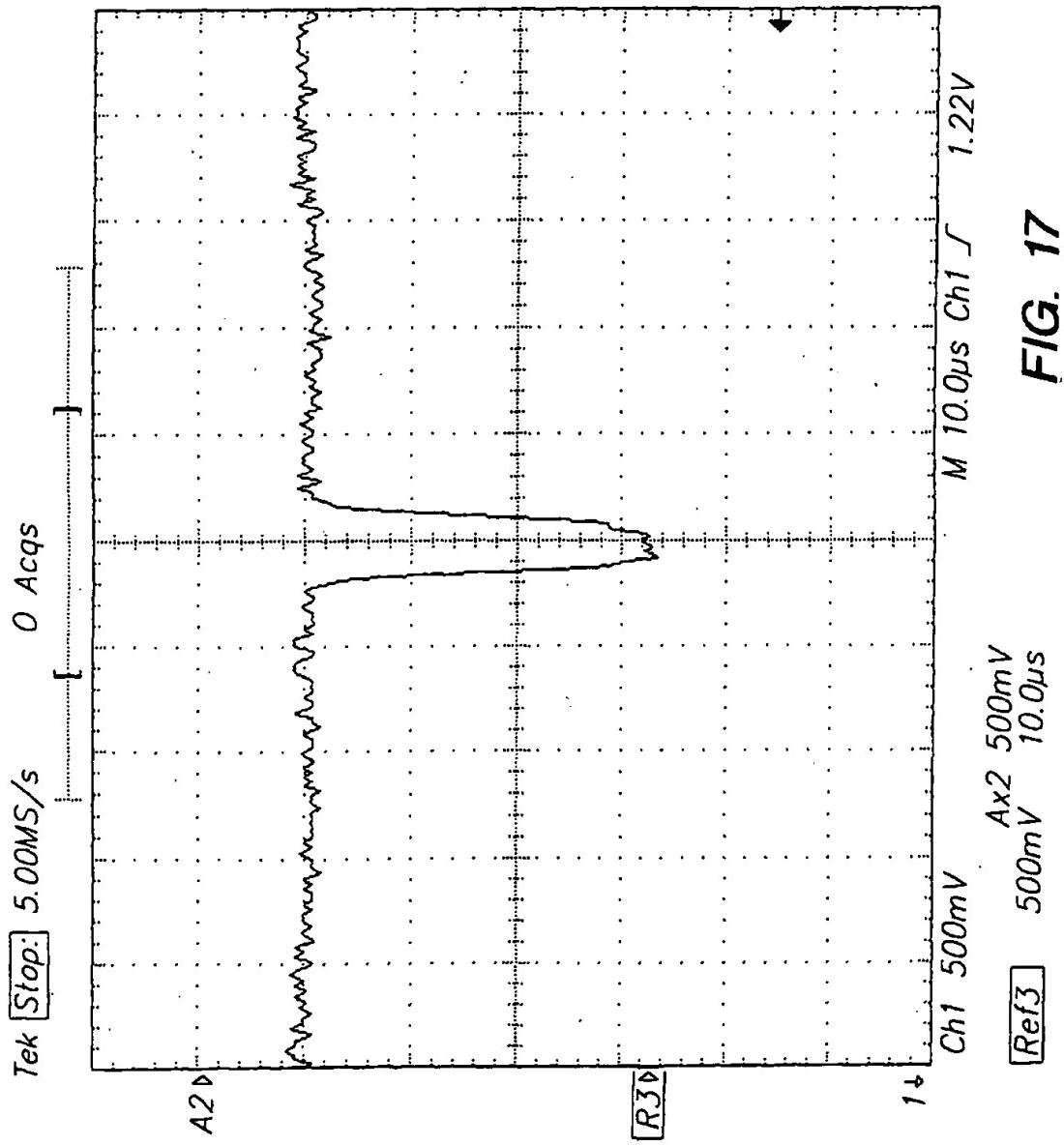


FIG. 17

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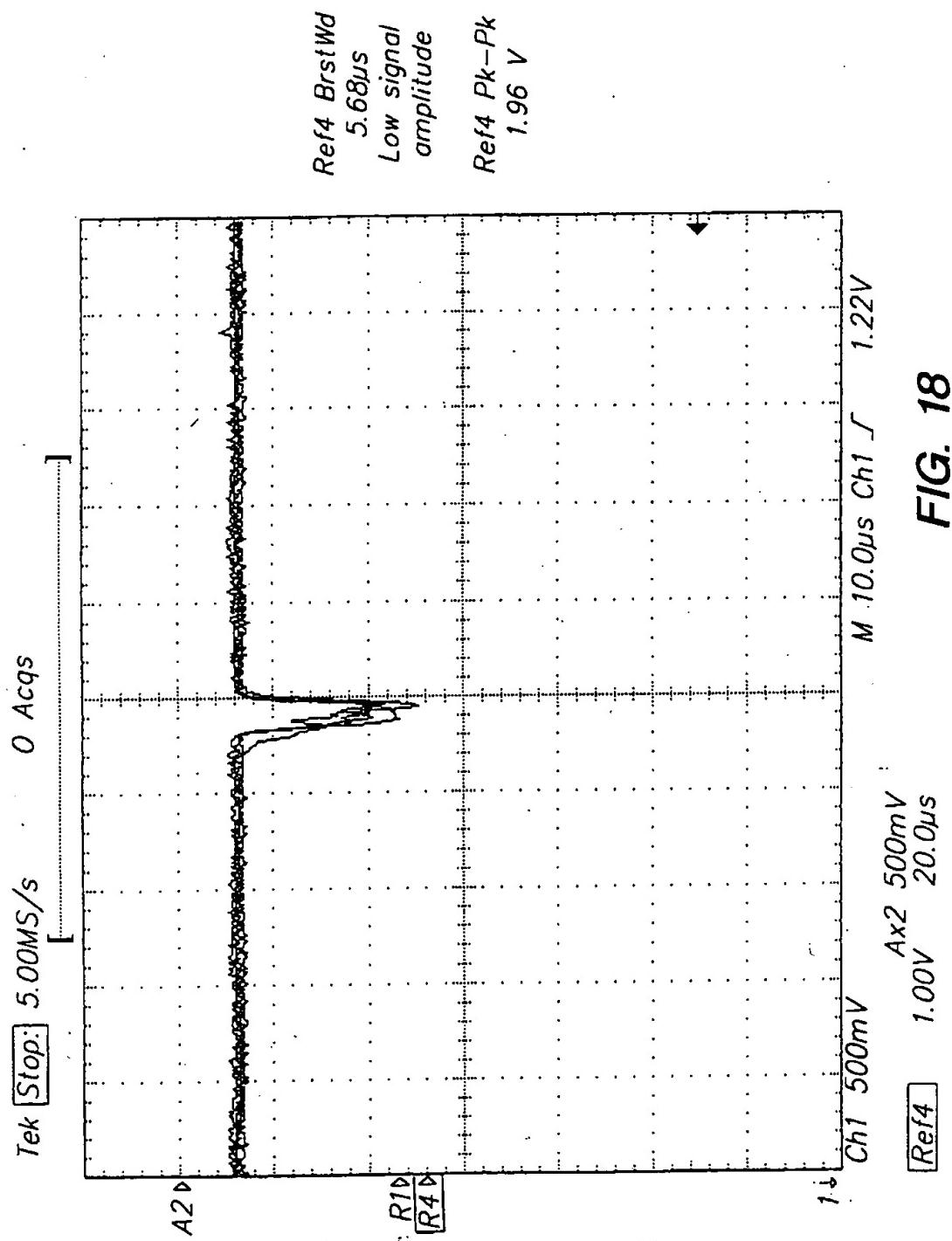
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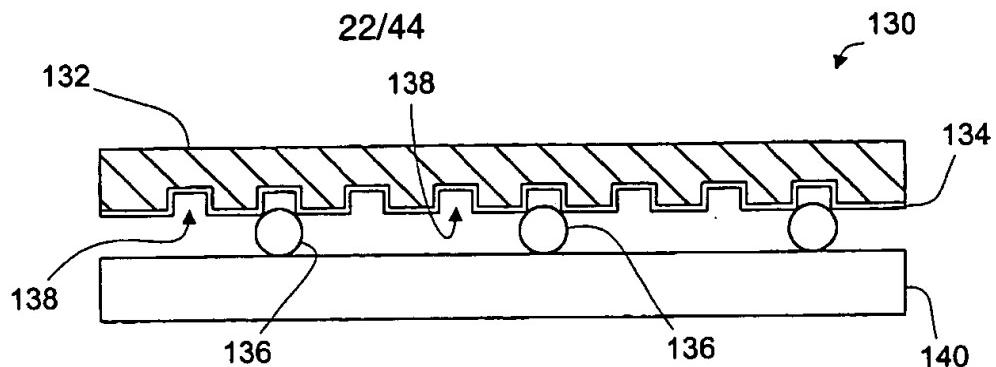
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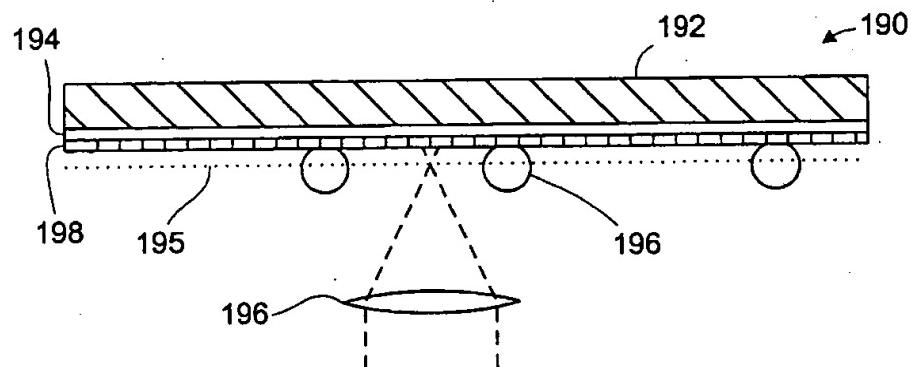


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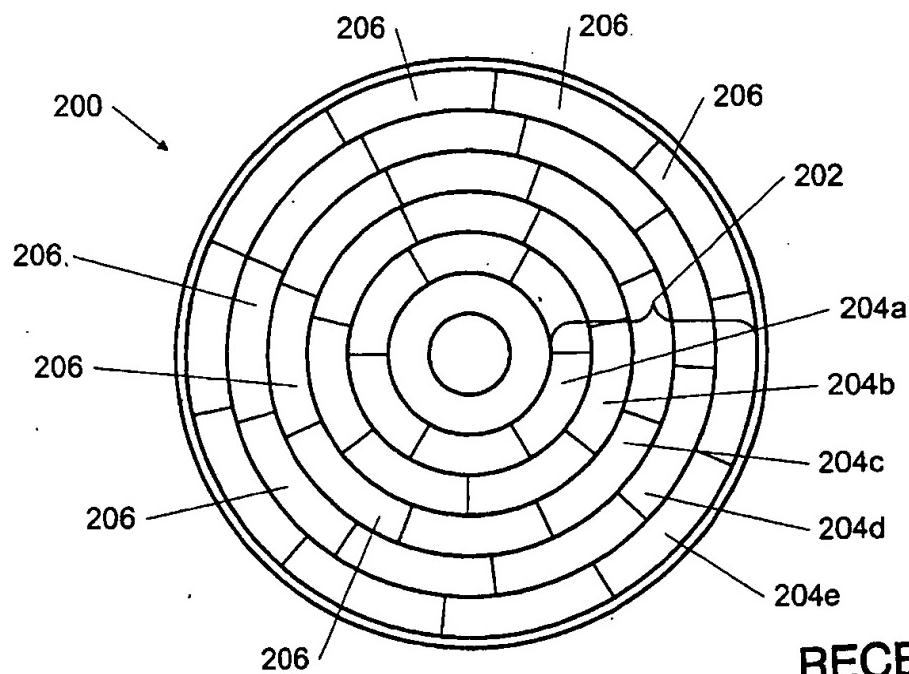
**FIG. 19**



**FIG. 20**



**FIG. 21**



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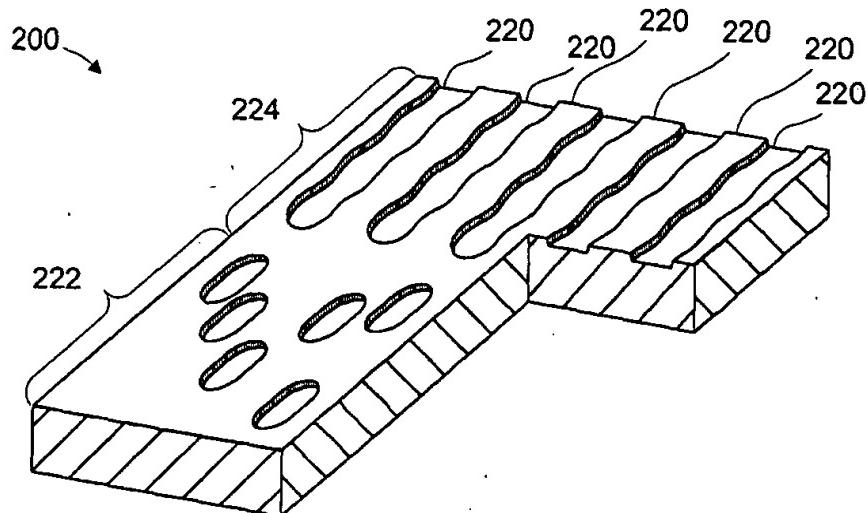
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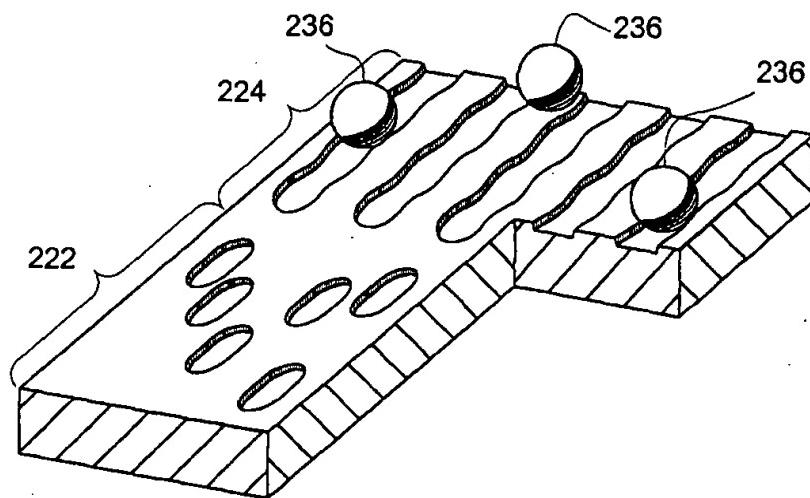


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**FIG. 22**



**FIG. 23**

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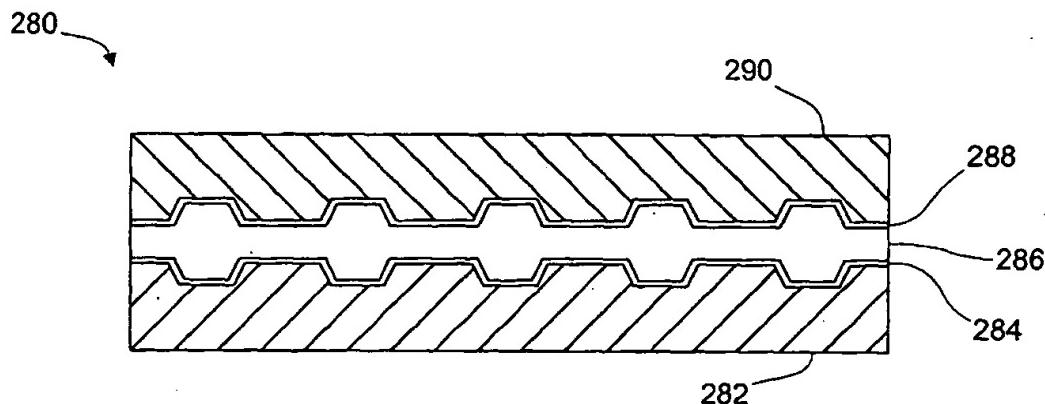
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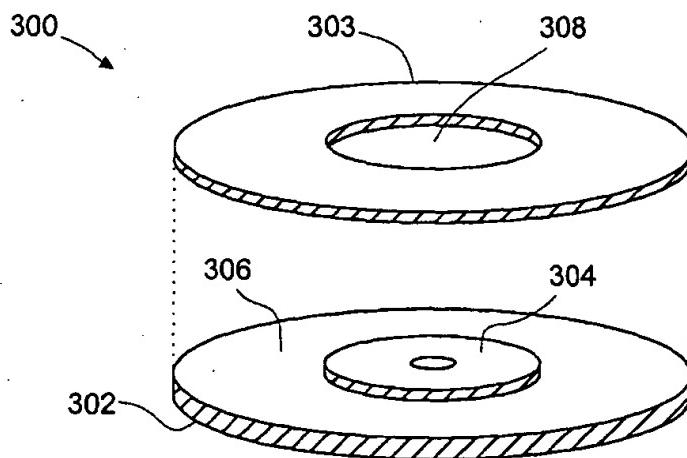


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**FIG. 24**



**FIG. 25**

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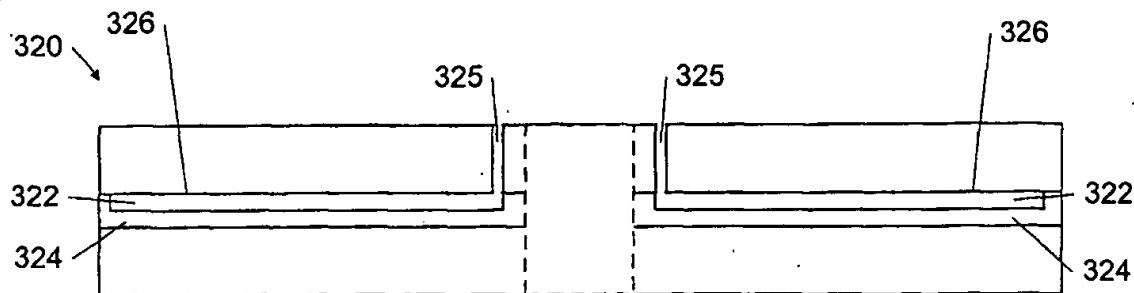
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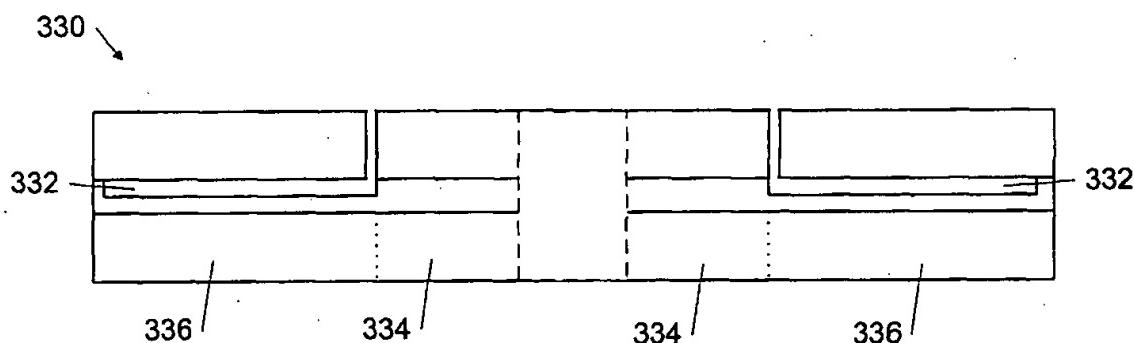


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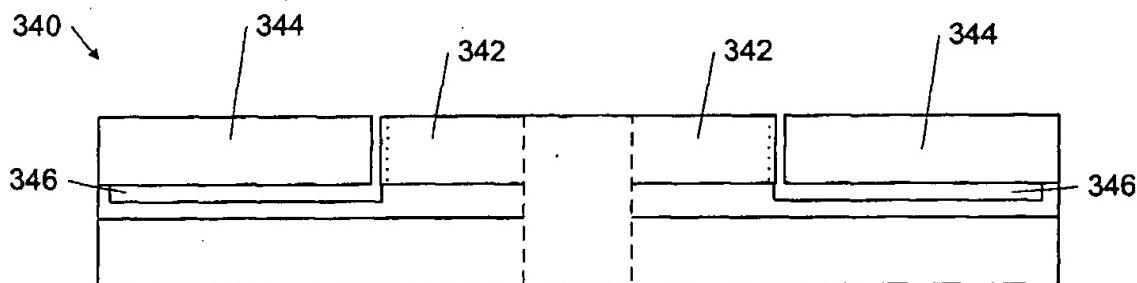
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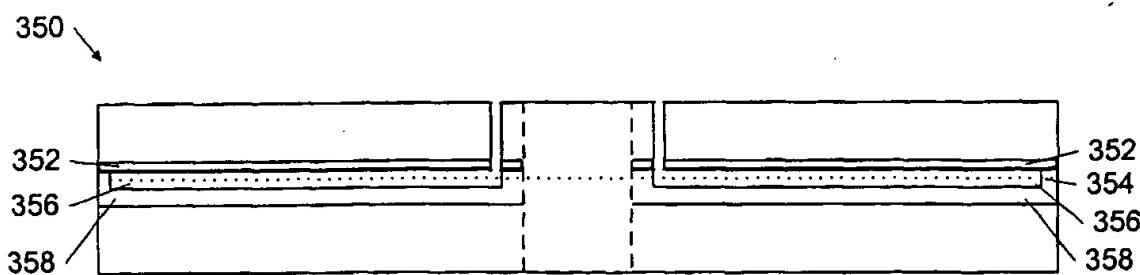
**FIG. 26**



**FIG. 27**



**FIG. 28**



**FIG. 29**

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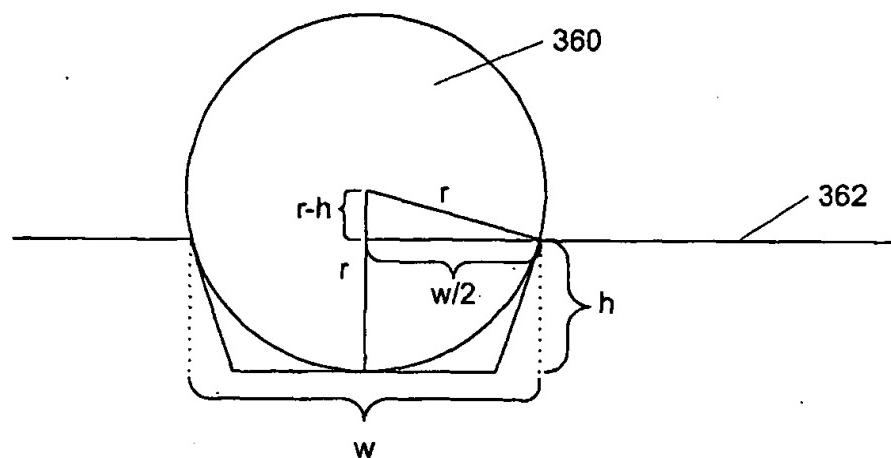
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**FIG. 30**

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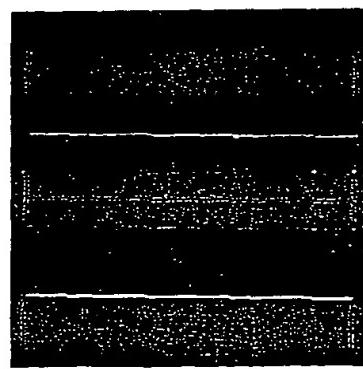
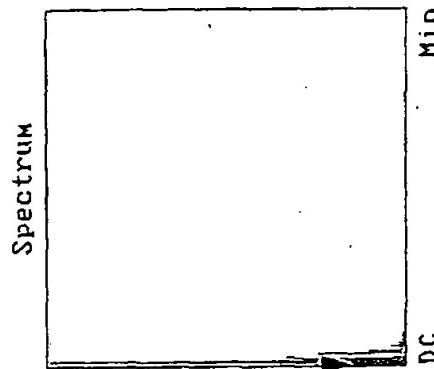
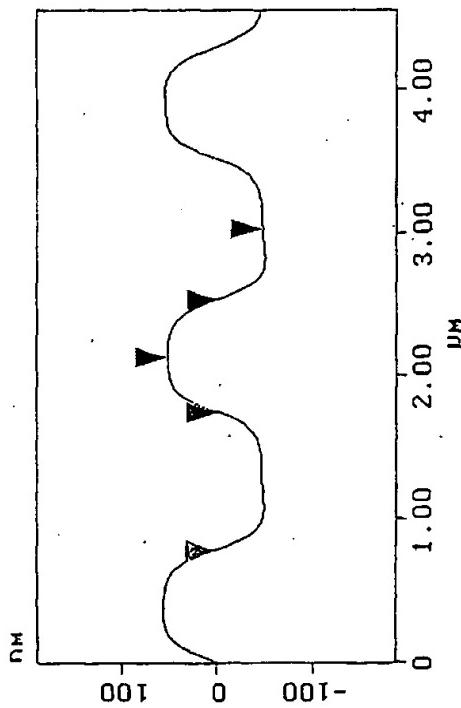


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L	800.78 nm
RMS	17.366 nm
IC	DC
Ra(Ct)	13.284 nm
Rmax	57.853 nm
Rz	57.853 nm
Rz Cnt	2
Radius	1.427 μm
Sigma	4.388 nm

Surface distance	912.31 nm
Horiz distance(LL)	898.44 nm
Vert distance	100.00 nm
Angle	6.351 deg
Surface distance	969.10 nm
Horiz distance	957.03 nm
Vert distance	7.528 nm
Angle	0.451 deg
Surface distance	817.07 nm
Horiz distance	800.78 nm
Vert distance	0.740 nm
Angle	0.053 deg
Spectral period	DC
Spectral freq	0 Hz
Spectral RMS amp	4.523 nm



cursor: average Zoom: 2:1

Min

Max

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FIG. 31

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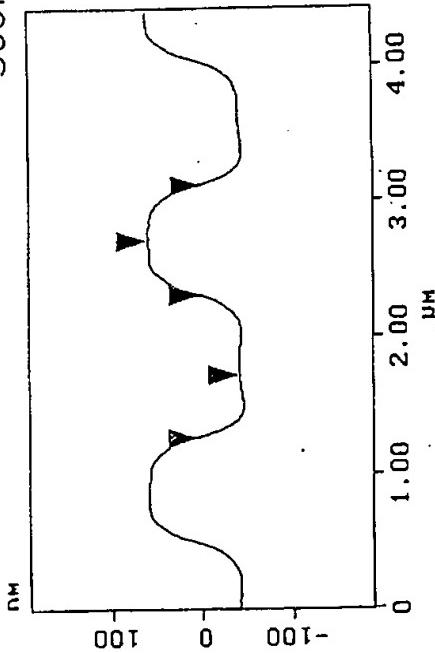
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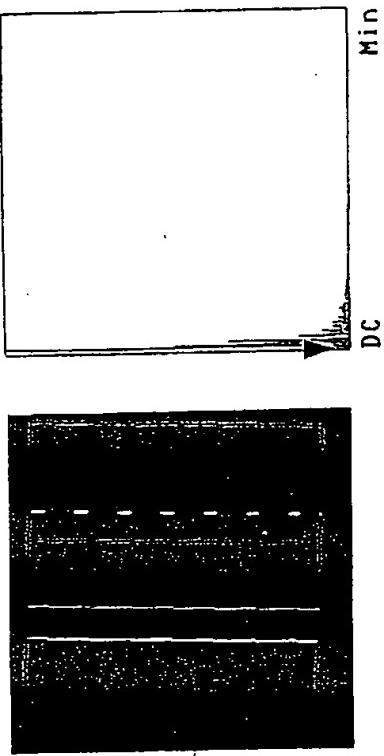
Title: TRACKABLE OPTICAL DISCS  
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ANALYTE MATERIAL  
Inventor: Mark O. Worthington  
Docket No: BT11 98100804(US)USX1P1X1

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Section Analysis



Spectrum



rm159out.000

Cursor: average Zoom: 2:1 Cen line: off Offset: off

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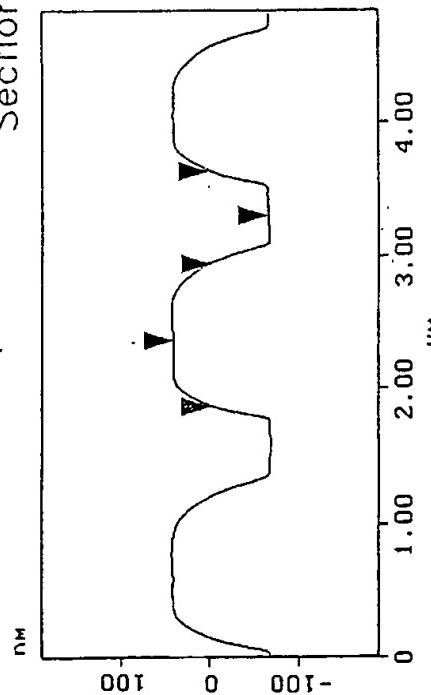
FIG. 32



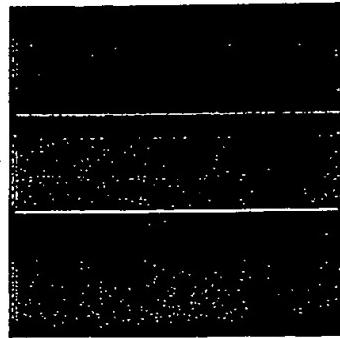
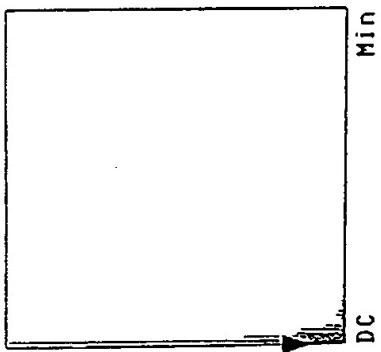
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Section Analysis



L	683.59 nm
RMS	21.794 nm
Ic	DC
Ra(Ic)	16.951 nm
Rmax	67.772 nm
Rz	66.682 nm
Rz Cnt	2
Radius	820.71 nm
Sigma	8.514 nm
Surface distance	956.26 nm
Horiz distance(CL)	937.50 nm
Vert distance	107.52 nm
Angle	6.543 deg
Surface distance	1.084 micrometers
Horiz distance	1.074 micrometers
Vert distance	4.127 nm
Angle	0.220 deg
Surface distance	715.65 nm
Horiz distance	683.59 nm
Vert distance	3.943 nm
Angle	0.330 deg
Spectral period	DC
Spectral freq	0 Hz
Spectral RMS amp	3.603 nm



Cursor: average Zoom: 2:1 cen line: off offset: off

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FIG. 33

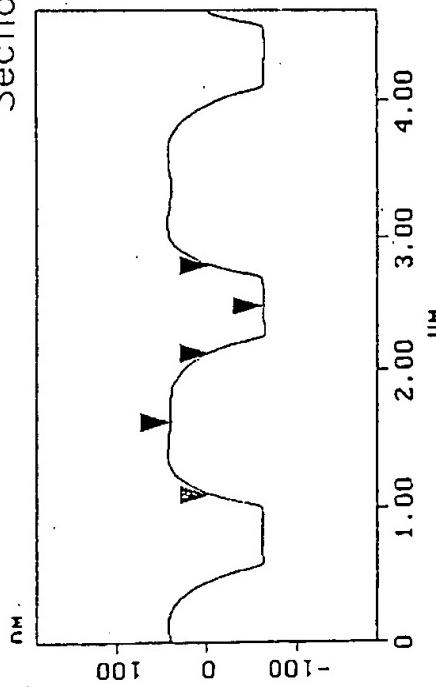
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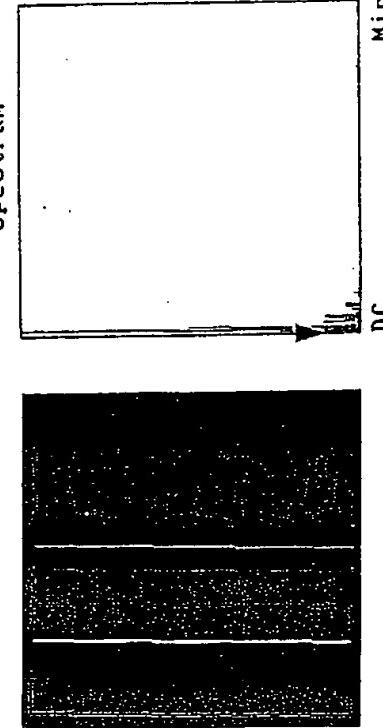
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Docket No: BTI1 98100804(US)USX1P1X1

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### Section Analysis



Spectrum



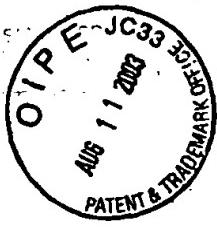
L	664.06 nm
RMS	20.135 nm
Ic	DC
Ra(C1c)	14.972 nm
RMax	66.116 nm
Rz	64.871 nm
Rz Cnt	2
Radius	824.44 nm
Sigma	8.988 nm
Surface distance	878.62 nm
Horiz distance(L)	859.38 nm
Vert distance	102.80 nm
Angle	6.821 deg
Surface distance	1.046 μm
Horiz distance	1.035 μm
Vert distance	4.540 nm
Angle	0.251 deg
Surface distance	695.52 nm
Horiz distance	664.06 nm
Vert distance	2.814 nm
Angle	0.243 deg
Spectral period	DC
Spectral freq	0 Hz
Spectral RMS amp	3.340 nm

Cursor: average Zoom: 2:1 Cen line: off Offset: off

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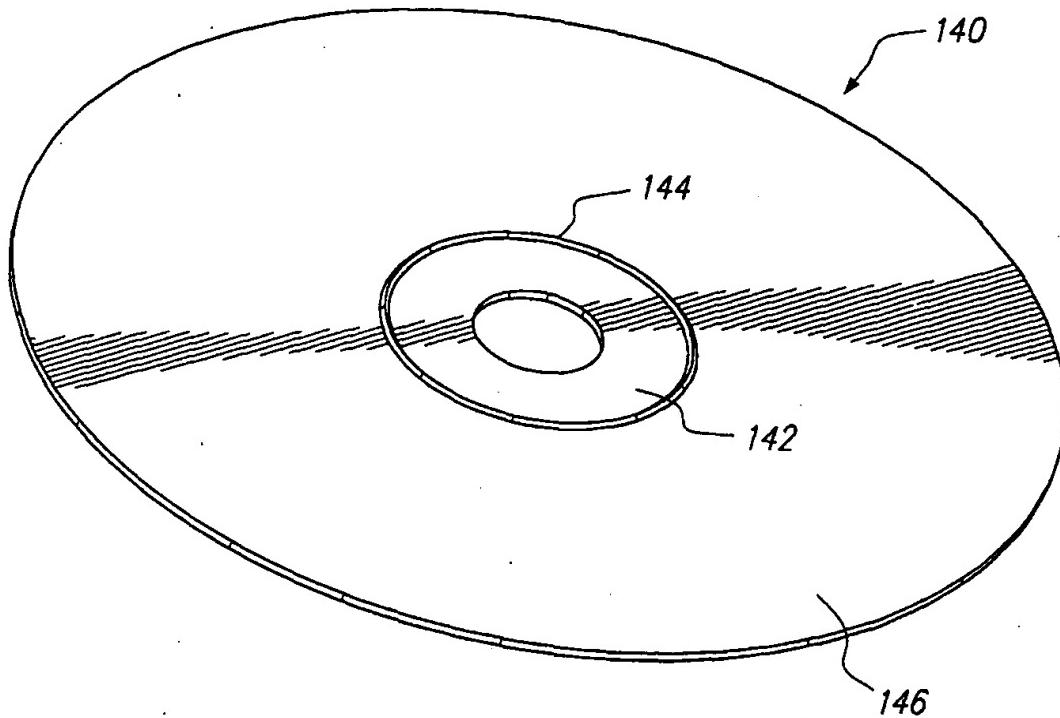
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FIG. 34



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**FIG. 35**

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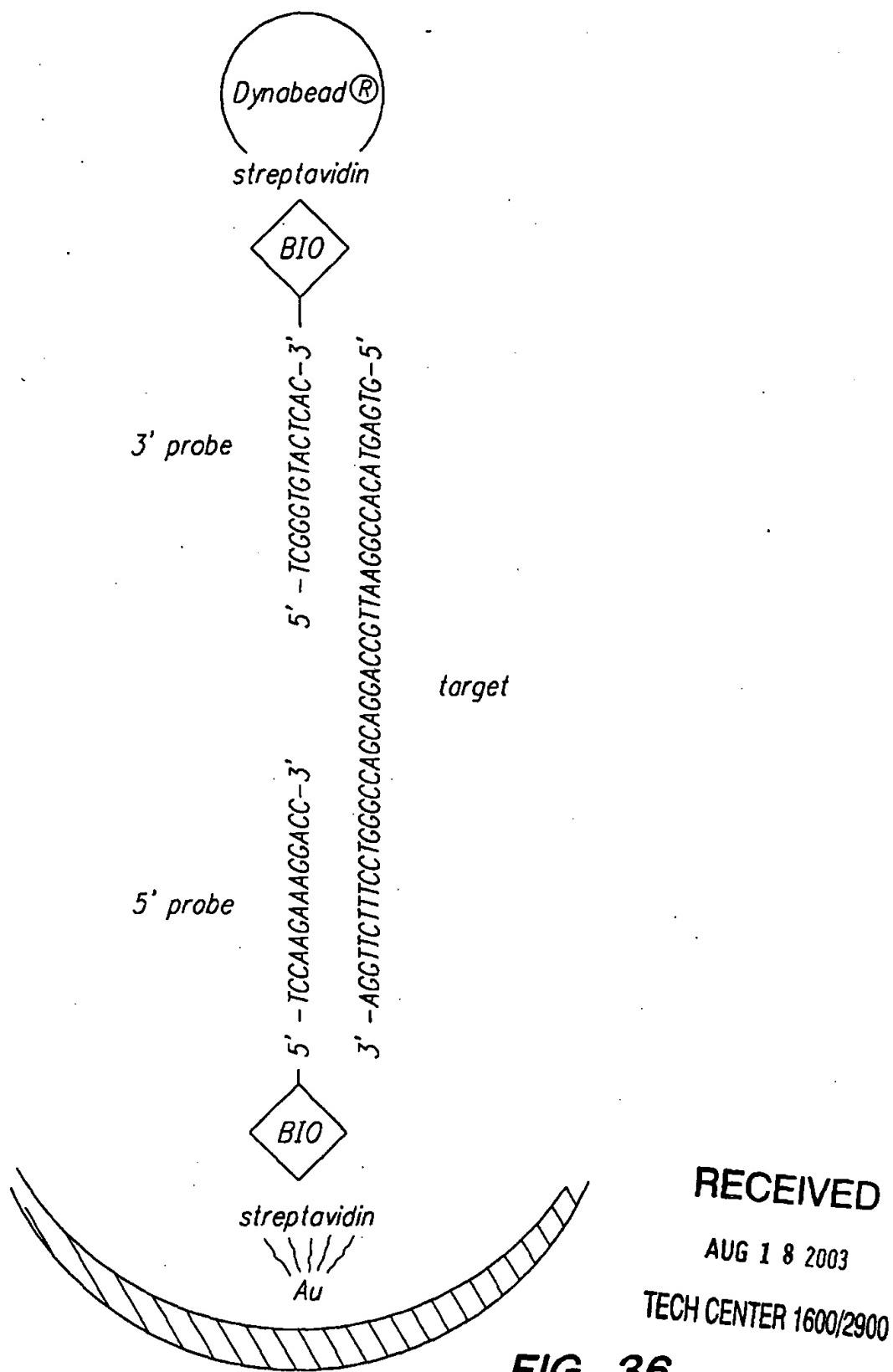
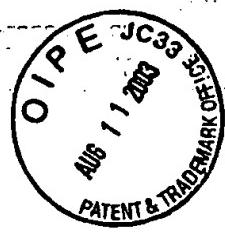


FIG. 36

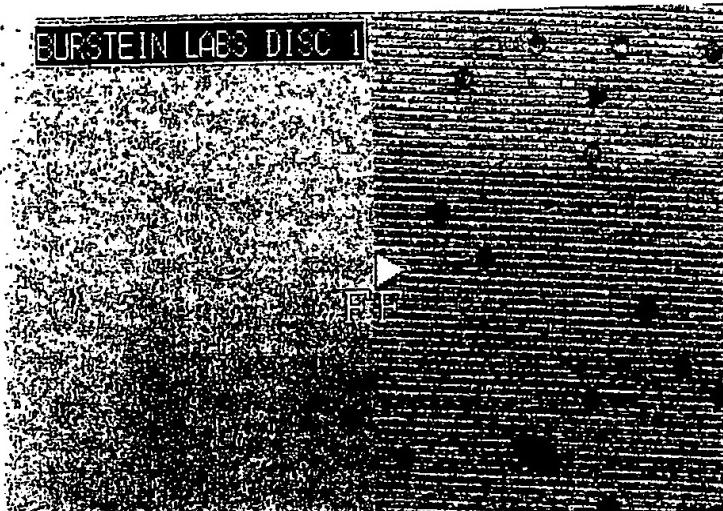


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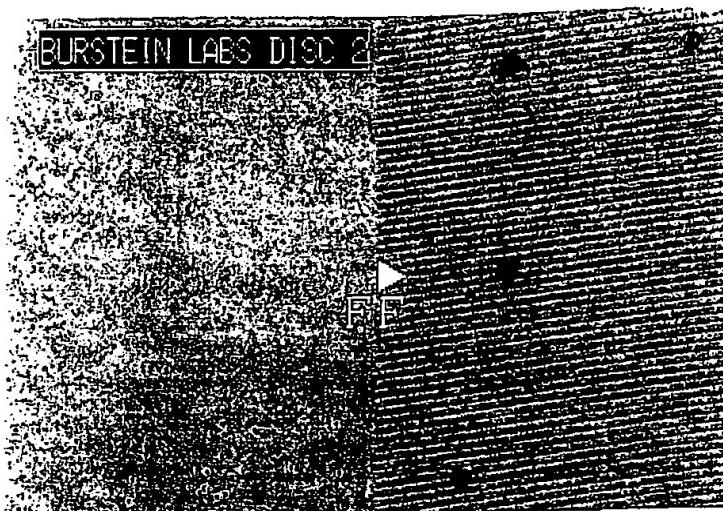
**FIG. 37A**

20 femtomoles



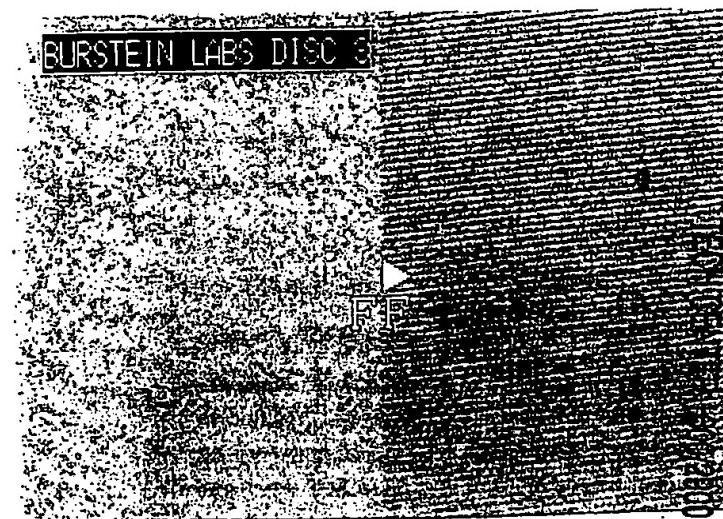
**FIG. 37B**

20 attomoles



**FIG. 37C**

20 zeptomoles



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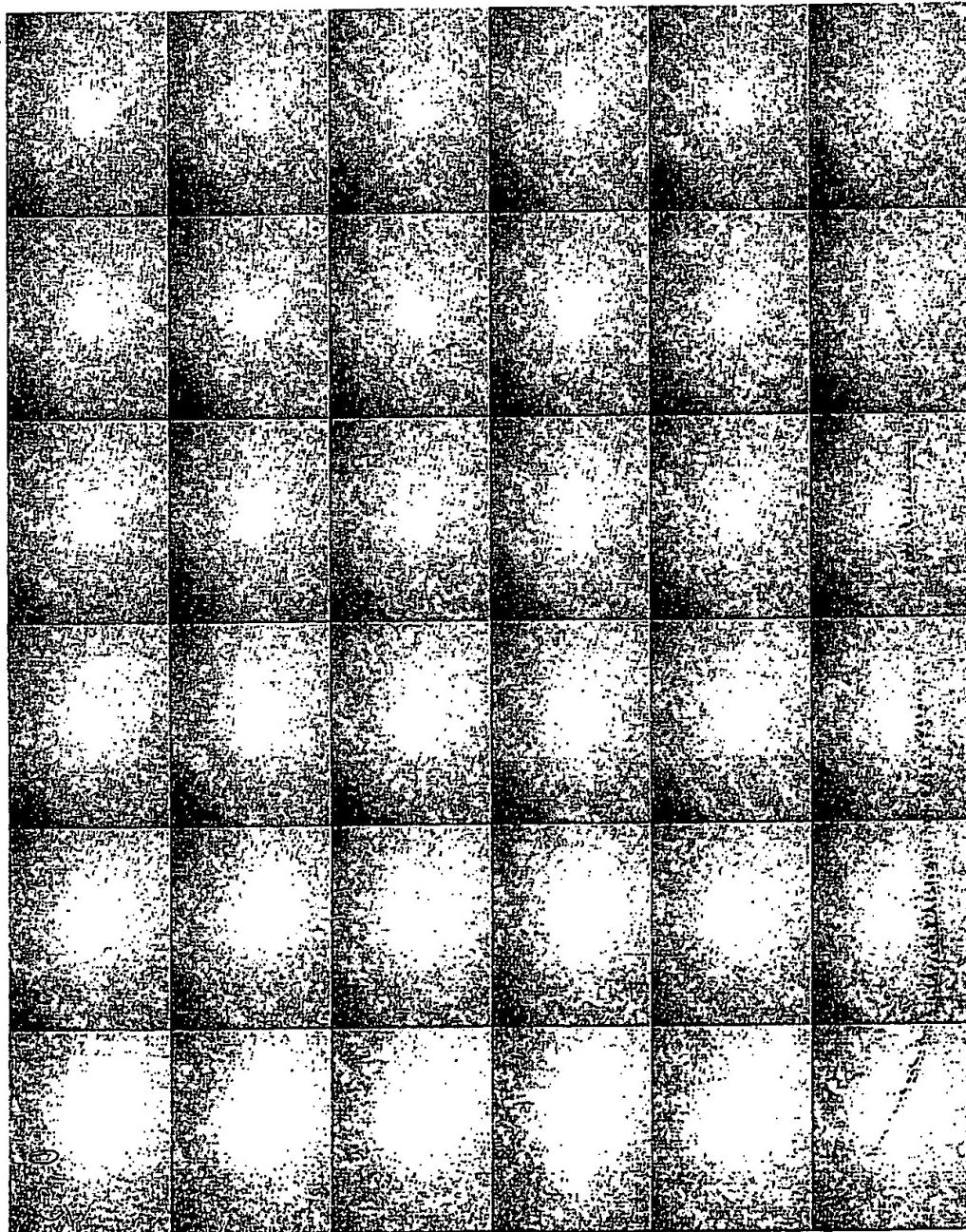
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FIG. 38



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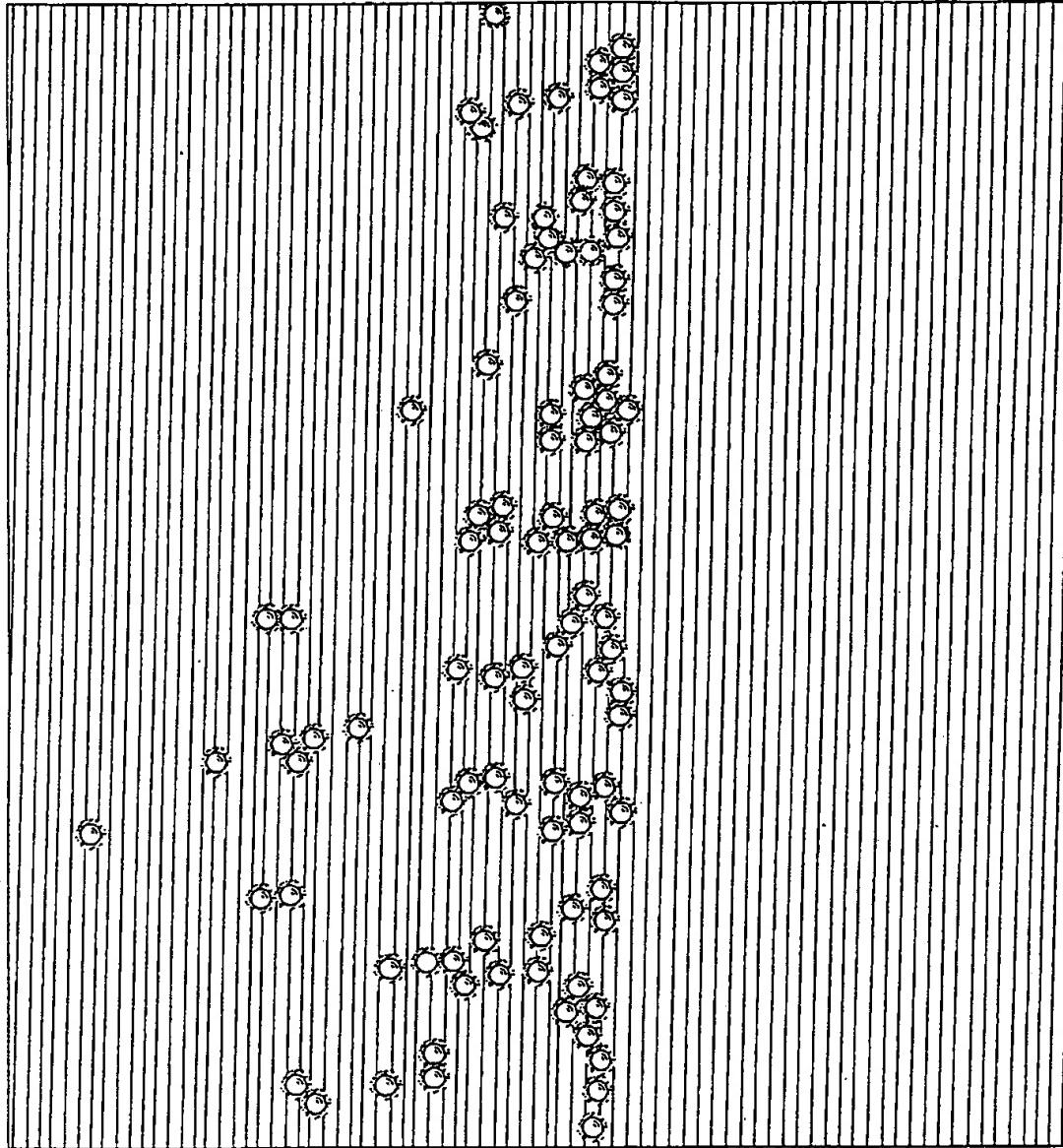
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**FIG. 39**

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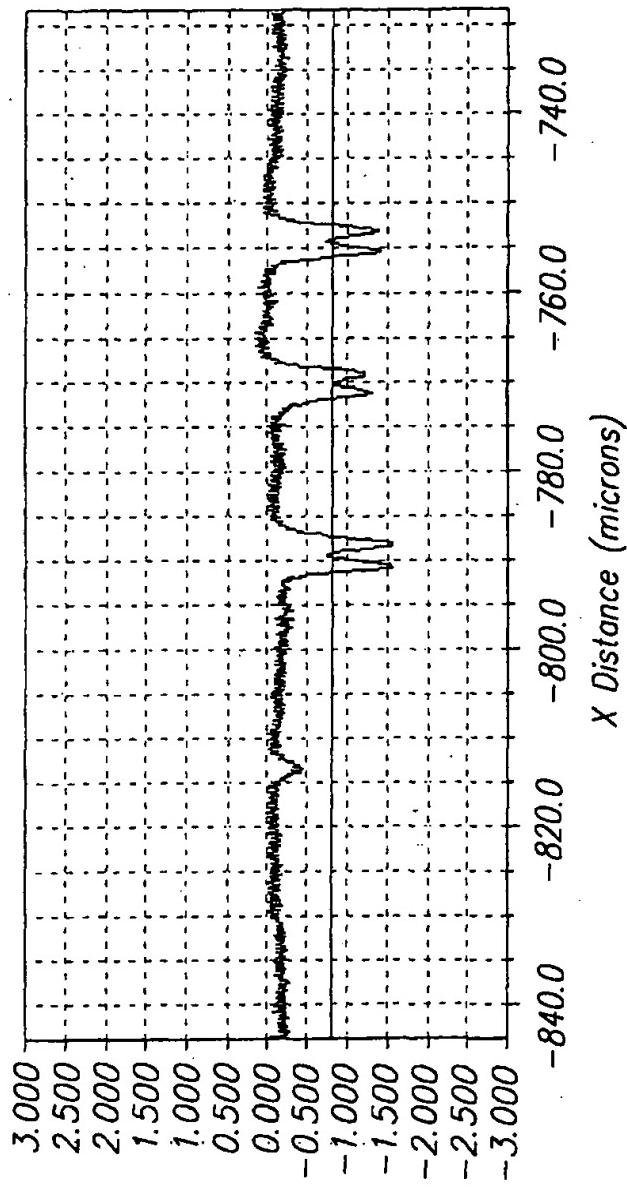
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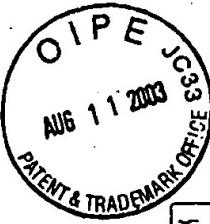


*FIG. 40*

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Supplementary sheet, mold acceptance test							CD-3-AWM	
	Job No	36-10236	Agent	CR-R	Ram hold	vac + mech	IFPI	-
SM Order No	9N.96293	Customer	Eximpo CS	Ram dia.	24	Product Code No.	256	
<i>Dimensions</i> 0=mold at top <i>Thickness</i>	0'	90°	180°	270°				
R15	1.15	1.155	1.15	1.15	mm		1/4. Center hole	✓
R40	1.155	1.155	1.155	1.155	mm		1/4. Stacking groove	✓
Center hole 15.05+/-0.3	15.05	Drm.	120+/-0.3	mm			1/4. Info	✓
<i>Weight in g</i>	Min	0	15	30	45	60	1/2	✓
Measure every 15 min. during test	g	15.26	15.27	15.26	15.26	15.26	1	✓
Max. diff±0.1 g	g	15.26	15.26	15.26	15.26	Burrs	3	✓
<i>Water in mold</i>	ACTUAL		DESIRED	Tol.				
Sprue bush	9	ltr./Min.	7	-1/+3			Scatches	3
Embosser	6	ltr./MIN.	7	-1/+3			Diesel effect	3
Vacuum		without	with	diff.	tol.		Brown Discoloration	5
Handling	bar							
Ram	bar							
<i>Mold Function</i>								
Embosser	✓							
Sprue ejector	✓							
Ejector sleeve	✓							
Sprue bush	✓							
Air outlet	✓							
FS dia.	✓							
BS dia.	✓							

Raw material  
Makrolon 2005 ✓  
Lexan 1020  
Panlite 5503

*Molding compound cold*  
Thickness of cavity (3)  
Venting gap (5)  
Position of embosser (9)  
Position of sprue bush (10)  
Embossing stroke

*Measuring means*  
Polarized light  
Halogen light  
Neon Light  
Black (UV Light)  
White paper  
Micrometer  
Balance

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FIG. 41A

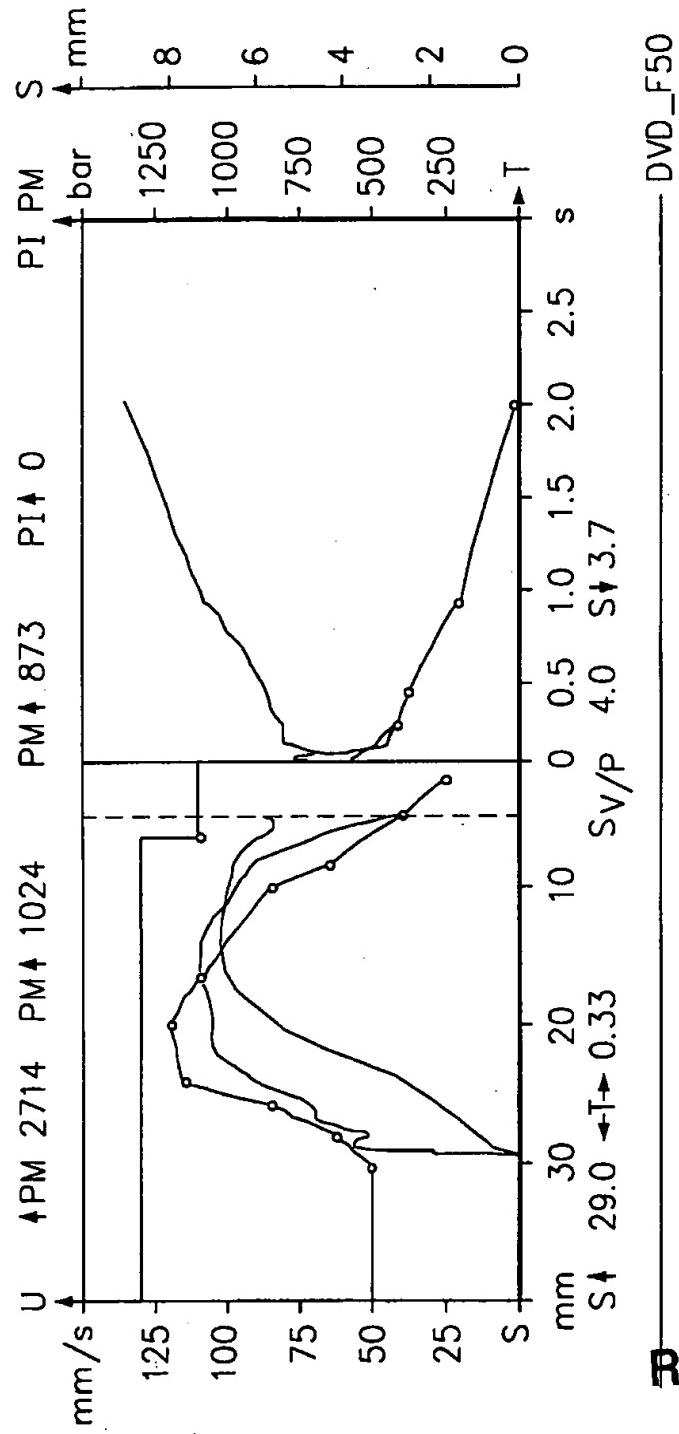


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Graph 1. Injection – Holding pressure

Cycle illustrated: 533957  
Curve display: continuous



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FIG. 41B



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01.01 Mold movement				
Closing movement	V33 = 100%	Closing time S33 = 019.0mm	T32	= 000.
Pressure initiation	V34 = 100%	S34 = 000.7mm		
Opening movement	V41 = 100%	Opening time S41 = 055.0mm	T36	= 000.
Braking	V42 = 010%			
Pause time	T40 = 000.000s	Mold position S640	=	075.
Mold closing pressures				
Closing pressure	P682 = 085%			
Pressure Build-up	P681 = 020%	T681	= 000.10s	
	C608 = 0	Switched off		
02.01 Summary of mold auxiliary controls/robotics				
Enable removal	T680 = 0065.0			
Delays				
Blow off sprue	T602 = 000.03	Sprue blowing time T603	=	000.1
Advance ejector pin	T53 = 000.10s			
Transfer stroke forward	T55 = 000.12s			
Transfer Stroke return	T56 = 000.15s	Extend removal T668	=	000.2
Embosser forward	T62 = 001.20s	Embosser return T63	=	000.1
Blow on nozzle side	T75 = 000.50s	Nozzle side blowing time T74	=	000.8
Blow on moving side	T671 = 000.00	Moving side blowing time T71	=	000.1
Unit Forward	T680 = 000.70s			
Starting program	C683 = 00000	T683 = 000.00s	S683	= 0004.
Cycle time	T11 = 009.05s			
Removal time	T640 = 000.70s			

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03.01 Metering					
Screw retraction	C17 = 0	Metering time	T21 =	Switched off	
Metering Delay	T20 = 000.50 s				
Metering stages	C124 = 2				
Metering end point	S23 = 026.0 mm	P23 = 0060 bar	N23 = 100 1.		
	S24 = 029.0 mm	P24 = 0010 bar	N24 = 020 1.		
Holding pressure	P27 = 0010 bar	Start of injection	SO =	029.0	
04.01 Injection					
Enable injection	S682 = 0002.0 mm	Screw position	S641 =	029.0	
Injection values	C121 = 10	Start of injection	SO =	029.0	
	V196 = 0050 mm/s	S196 = 030.0 mm			
	V197 = 0062 mm/s	S197 = 027.6 mm			
	V198 = 0085 mm/s	S198 = 025.6 mm			
	V199 = 0115 mm/s	S199 = 024.0 mm			
	V200 = 0120 mm/s	S200 = 019.8 mm			
	V201 = 0110 mm/s	S201 = 016.2 mm			
	V202 = 0085 mm/s	S202 = 009.5 mm			
	V203 = 0065 mm/s	S203 = 008.0 mm			
Enable V/P changeover	V204 = 0040 mm/s	S204 = 004.0 mm			
Forcible changeover	V205 = 0025 mm/s	S205 = 001.5 mm	T2 =	000.3	
		V/P changeover point	S11 =	004.0	
Flow number	S121 = 018.2 mm	S122 = 015.0 mm	C125 =	2776	
Pressure monitoring		Peak pressure	P125 =	01044	
First stage	P101 = 01300 bar	T201 = 00.02 s			
Second stage	P102 = 01100 bar	T201 = 00.02 s	S102 =	006.0	

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FIG. 41D



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**FIG. 41E**

**04.02 Holding pressure, cooling**

Holding pressure values	C122 = 04 P12 = 00550 bar	Changeover point	S11 = 004.0
P117	= 00420 bar	T117 = 000.20	
P118	= 00380 bar	T118 = 000.40	
P119	= 00200 bar	T119 = 000.90	
Holding pressure time		T120 = 002.00	
Cooling time	T39 = 005.30 s		
Melt cushion monitoring			
Upper limit	S219 = 010.0 MM	Melt cushion Lower limit	S19 = 003.7 S19 = 000.5

**05.01 Nozzles, unit, purging/dry cycles**

Standstill monitoring	C606 = 60 min	C640 = 0004 min	
Unit forward	T680 = 000.70 s	V29 = 030 %	
Lift	T30 = 000.30 s	V30 = 050 %	
Unit set-up and manual movements			
Move forward	V816 = 030 %	Lift V806 = 030 %	
Purge/dry cycle/clean			
Number of metering strokes	C16 = 20	C201 = 50	
Metering	S16 = 028.0 mm	P16 = 0060 bar	
Injection	S18 = 001.5 mm	V101 = 05 mm/s	
Delay for purging	T606 = 000.00 s		200

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**06.01 Temperature control, plastifier zones/temperature control devices**

Zone/description	Set point	Actual value	Reduced	Tolerance	Heating outputs	Cooling
Zone/description	Set point	Actual value	Reduced	Tolerance	Heating outputs	Cooling
10 Melt temperature	310° C	305° C	180° C	040° C	040° C	014%
30 Nozzle	330° C	330° C	180° C	040° C	040° C	025%
13 Nozzle	315° C	315° C	180° C	040° C	040° C	008%
Cylinder head	310° C	310° C	180° C	040° C	040° C	005%
15 Compression	305° C	305° C	180° C	040° C	040° C	006%
16 Compression	305° C	308° C	180° C	040° C	040° C	070%
18 Feed	300° C	295° C	180° C	040° C	040° C	024
20 Inlet	060° C	060° C	060° C	040° C	040° C	
24 Heating/cooling device	112° C	093° C	050° C	020° C	020° C	000%
25 Heating/cooling device	114° C	091° C	050° C	040° C	020° C	000%
<b>08.01 Disk transfer</b>						
Peripheral interface	C684 =	0		Without signal acknowledgement		
Buffer switch-off size	C680 =	65000				
Production delay	T682 =	001.00 s	C605 =	0		With interruption of cycle
Max. transfer time	T680 =	001.00 s				

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**F/G. 41F**



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09.01 Production control						
Application	C340 = 2	No application				
Data set number	C315 = 100					
Production sequence						
Item number	C303 = 1	Piece counter C324 = 29270				
Cycle time	T11 = 009.05 s	Cycle counter C325 = 29270				
Production preparation		Failure rate C718 = 30.56%				
		Reason C357 = 00				
10.01 Process statistics						
Q monitoring	C340 = 2	Monitoring without screening out				
Q report	C700 = 0	No report				
	cycles of which	out of tolerance				
Total	C325 = 29270	C318 = 8946				
Random sample	C326 = 29269	C338 = 8946				
Process variables	Set Point	Tolerance	Actual Value	Mean	Scatter	Out of Tolerance
Metering time	x	+/-	x	xq	3s	
Injection start	1.20	0.30	5.98 s	2.32	5.408	-06786
Injection time	30.1	2.0	29.0 mm	28.6	0.82	2028
V/P changeover point	0.47	0.20	0.33s	0.39	0.105	0
Melt cushion	3.5	1.0	4.0 mm	4.0	0.04	0
? peak value	4.2	1.0	3.7 mm	3.8	0.25	0
? peak value	600	200	871 bar	682	99.9	-06566
Flow number	0	0	0 bar	0	0.0	
Cycle time	2500	300	2776	2441	99.9	359
	3.90	0.50	9.05 s	5.08	6.421	-06570

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## RELEVANT

### 10.02 Configuration of the quality

Reaction: Process data outside tolerance  
Switch-off behavior C703=0 no reaction

### 10.03 Q report intermediate store

Manufacturer  
Machine No. DVD\_F50  
Job data

F/G. 41H

### 16.01 System characteristics

Machine data  
Machine type DISCJET 600/110  
Control version PAC 13.54  
Database version DB 05.80  
Special 350400

Order number IMC 12.26  
Date created 23.10.1996  
Version 17106

Mold data  
Installed height S90 = 160 mm

Plasticizing	Identification S801 = 032.0 mm	024	C804 = 0024
Ram nominal diameter	P800=01482 bar	Max metering stroke	S802 = 100.0
Max. permissible melt pressure	P801 = 0317 bar	Max. specific melt pressure	P802 = 01482 bar
Max. permissible backpressure			
Temperatures	Set point/actual value	Tolerance -/+	Cooling
Cabinet	TH1 = 035 026° C	030° C 010° C	
Oil	TH2 = 050 051° C	041° C 011° C	000% 005

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